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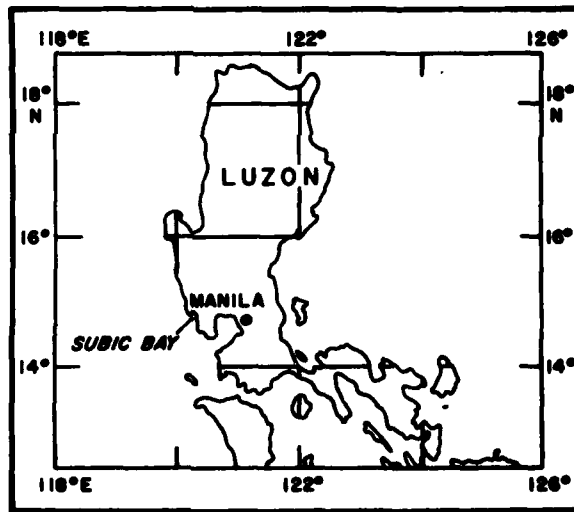
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INFORMAL REPORT

ENVIRONMENTAL DATA REPORT
SUBIC BAY,
REPUBLIC OF THE PHILIPPINES,
JANUARY AND FEBRUARY 1965



APRIL 1970

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ABSTRACT

The U.S. Naval Oceanographic Office (NAVOCEANO) conducted a limited environmental survey in Subic Bay, Republic of the Philippines, in January and February 1965. The purpose of the survey was to measure oceanographic environmental parameters in support of NAVOCEANO's mine warfare program. Temperature and salinity measurements and bottom sediment samples were obtained at 10 stations. Two of these stations were time-series anchor stations with current measurements and ambient noise recordings.

The influence of tidal currents are thought to be responsible for the fluctuation of higher density waters through the entrance channel to Subic Bay on either slope of predicted high water.

Maximum current speed was 0.4 knot. Characteristically, flow direction at intermediate levels often differed from the flow of the surface and near-bottom depths.

DALE E. KENNEY
Nearshore Surveys Division
Oceanographic Surveys Department

This report has been reviewed and is approved for release as an UNCLASSIFIED Informal Report.


L. B. BERTHOLF
Director, Nearshore Surveys Division

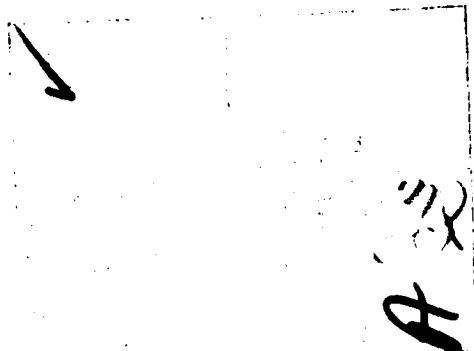


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I. INTRODUCTION

The U.S. Naval Oceanographic Office (NAVOCEANO) conducted a limited environmental survey in Subic Bay, Republic of the Philippines, in January and February 1965 from USS ENERGY (MSO 436) and USS ABNAKI (ATF 96). The purpose of the survey was to measure oceanographic environmental parameters in support of NAVOCEANO's mine warfare program.

Ten Nansen cast stations were occupied: seven stations along a track in the approaches to Subic Bay on 22 January and three stations, two of which were time-series anchor stations with current measurements and ambient noise recordings, in the entrance channel between Grande Island and Macmany Point from 17 to 19 February (Fig. 1). A station data summary is presented in Table I.

Subic Bay is a deep, semi-enclosed basin with steep sides and a generally mud bottom. The bay gradually shallows from the entrance channel near Grande Island northward to the shoreline. The climatology is largely influenced by the monsoons and the trade winds. Current flow seaward of Subic Bay generally sets northward throughout the year with the stronger currents associated with the summer months. The northeast monsoon, November to March, brings weaker currents and drier weather.

II. METHODS OF COLLECTION AND ANALYSIS

A. Temperature.

Six to 12 Nansen bottles were used per cast, and with the exception of station 1, only paired, protected reversing thermometers were utilized. By alternating individual thermometers and forming new pairs, a reliable temperature relationship among the thermometers was established. Consequently, a correction factor could be applied to certain thermometers that had consistent errors. This factor, along with the standard thermometer corrections, was applied to the temperature values, and temperatures are considered accurate to $\pm 0.02^{\circ}\text{C}$.

B. Salinity.

Water samples were drawn from Nansen bottles, and salinity determinations were made in the field with an Industrial Instruments RS-7A induction salinometer. With this instrument, salinity can be measured with a precision of ± 0.003 o/oo. In consideration of the probable sources of error, instrumental and observational, an accuracy of ± 0.01 o/oo is realistic for this survey.

C. Bottom Sediments.

Kullenberg cores were obtained at stations 8, 9, and 10. The samples were analyzed in the field for engineering properties and

sediment size and composition. Some distortion in the cores resulted before analysis, and the values obtained for the engineering properties are questionable.

D. Current Measurements.

Five Roberts current meters were used to obtain currents at the time-series stations. Because of the proximity of stations 9 and 10, the data are presented as one continual station covering a 36-hour period (24 and 16 hours each, respectively). The time gap occurred in the record when ship relocation and equipment malfunction halted operations. Current observation depths ranged from the surface to near bottom.

The calibration limitations of the Roberts current meter is 0.2 to 5.0 knots. Many values obtained were near 0.1 knot, which is the approximate threshold level for the meter. If a discernable record was attained near the threshold level, the measurement was included in the analysis. Of the 128 current observations attempted, approximately 35 percent were unusable and an additional 16 percent of the observations showed current speeds below the threshold level of the meters. The current directional values are considered accurate to ± 10 degrees.

E. Ambient Noise.

Ambient noise was measured with an AN/PQM-1A Noise Level Meter. The meter has a frequency range of 20 to 40,000 Hz and a pressure level range of 30 to 145 decibels referred to a reference level of 0.0002 dynes/cm².

The hydrophone was mounted on a tripod located 180 meters east of station 10 at a depth of 24 meters. Recordings were obtained for 3-minute intervals 30 minutes before sunrise and 30 minutes after sunset. The calibration and the recording of ambient noise followed the technique outlined in the AN/PQM-1A instruction manual. The data obtained were analyzed on an 8-channel Sanborn recorder using a B&K 3rd octave spectrometer. The values used in this report are the average sound pressure level of the central frequency of each 1/3 octave corrected for attenuation, cable, and equipment loss. The resulting sound pressure levels then were reduced to sound pressure spectrum levels for analysis.

F. Meteorological and Tide Observations.

NAVOCEANO personnel obtained meteorological observations either visually or by hand-held equipment. Tide values used in this report are predicted values from USC&GS tide tables with Manila as the reference station.

III. DISPOSITION OF DATA

The serial-depth temperature and salinity values were computer processed at NAVOCEANO. Machine listings provided electrical conductivity, density (σ_t), and sound velocity determinations for each depth. The computer-processed station data sheets are presented in Appendix A.

The core analysis summary sheets are presented in Appendix B. Original current data and ambient noise recordings are retained at NAVOCEANO.

IV. PRELIMINARY ANALYSES

A. Temperature.

A temperature cross section of stations 1 through 7 is shown in Figure 2. A density-time-depth composite for Station 10, indirectly depicting the hourly thermohaline variations occurring for each recorded depth, is presented in Figure 3.

Temperature measurements taken hourly during the time-series stations showed that the maximum horizontal fluctuation did not exceed 1.1°C for any measured depth over the 36-hour period of observations. Measurements of the vertical temperature range revealed a maximum variation of 1.6°C within the water column. Relatively little fluctuation in horizontal temperature was evident while occupying Station 9. With the advent of the following flood tide, subsequent changes in the temperature and salinity structure resulted in density fluctuations for all observed subsurface depths (Fig. 3). The increases in density appeared on either slope of predicted High Water.

B. Salinity.

Salinity values ranged from 33.49 to 34.47 o/oo. Figure 4 is a salinity cross section for stations 1 through 7. Observations taken during the time-series stations showed a maximum hourly range in vertical salinity of 0.34 o/oo. For any one observed depth, maximum horizontal fluctuation in salinity was 0.25 o/oo. The stability of the water column for the first 24 hours (Station 9) was attested to by a maximum horizontal fluctuation of 0.11 o/oo. Subsequent measurements revealed slight increases in salinity accompanying the temperature decreases, resulting in the density fluctuations depicted in Figure 3.

C. Bottom Sediments.

The core samples showed a generally greenish-colored sand with high contents of clays and silts. Calcium carbonate comprised, by weight, 18 to 37 percent of the samples' mineral composition. Quartz and calcite were the dominant and secondary minerals, respectively. The high standard deviations evident in the sediment size analyses attest to the poorly sorted nature of the sediments.

D. Current Measurements.

Current measurements also are depicted in Figure 3. Maximum recorded current speed was 0.4 knot. Current speed and direction varied throughout the water column. Characteristically, flow direction at intermediate levels often differed from the flow at the surface and near-bottom depths. Observed near-bottom flow was an inflowing current for the full 36-hour period regardless of the tidal cycle. Surface currents appeared to be in harmony with the tidal cycle more so than subsurface flows: The termination of a tidal period generated a reversal in surface flow direction. The increases in density at Station 10 indicated a fluctuation of higher density water through the entrance channel as a result of tidal currents.

E. Ambient Noise.

Recognizable sound sources evident to the observers were snapping shrimp and a channel buoy. Therefore, the recording times were chosen to correspond to the periods of maximum activity of snapping shrimp, which were thought to be the dominant noise source. The rise in the sound pressure level between 2kHz and 20kHz (Fig. 5) is compatible with prior research¹ on the role of snapping shrimp in the production of underwater noise. Observed sea state levels did not exceed "two" during the recordings, and Knudsen's curves for ambient noise levels² are presented in Figure 5.

Transient noise anomalies were present in the lower frequencies, especially during the morning recordings. The occurrence of the transient noise anomalies decreased from a maximum in the 40 to 125Hz band widths to an insignificant amount over 2.5kHz. Besides the sound from the channel buoy and random noises from the listening ship, the low frequency transient noise sources were not identifiable.

¹ M.W. Johnson, F.A. Everest, and R.W. Young. 1947. The Role of Snapping Shrimp (*Crangon* and *Synalpheus*) in the Production of Underwater Noise in the Sea. Biol. Bull. Woods Hole, 93(2): 122-138.

² V.M. Albers. 1965. Underwater Acoustic Handbook II. Pennsylvania State University Press.

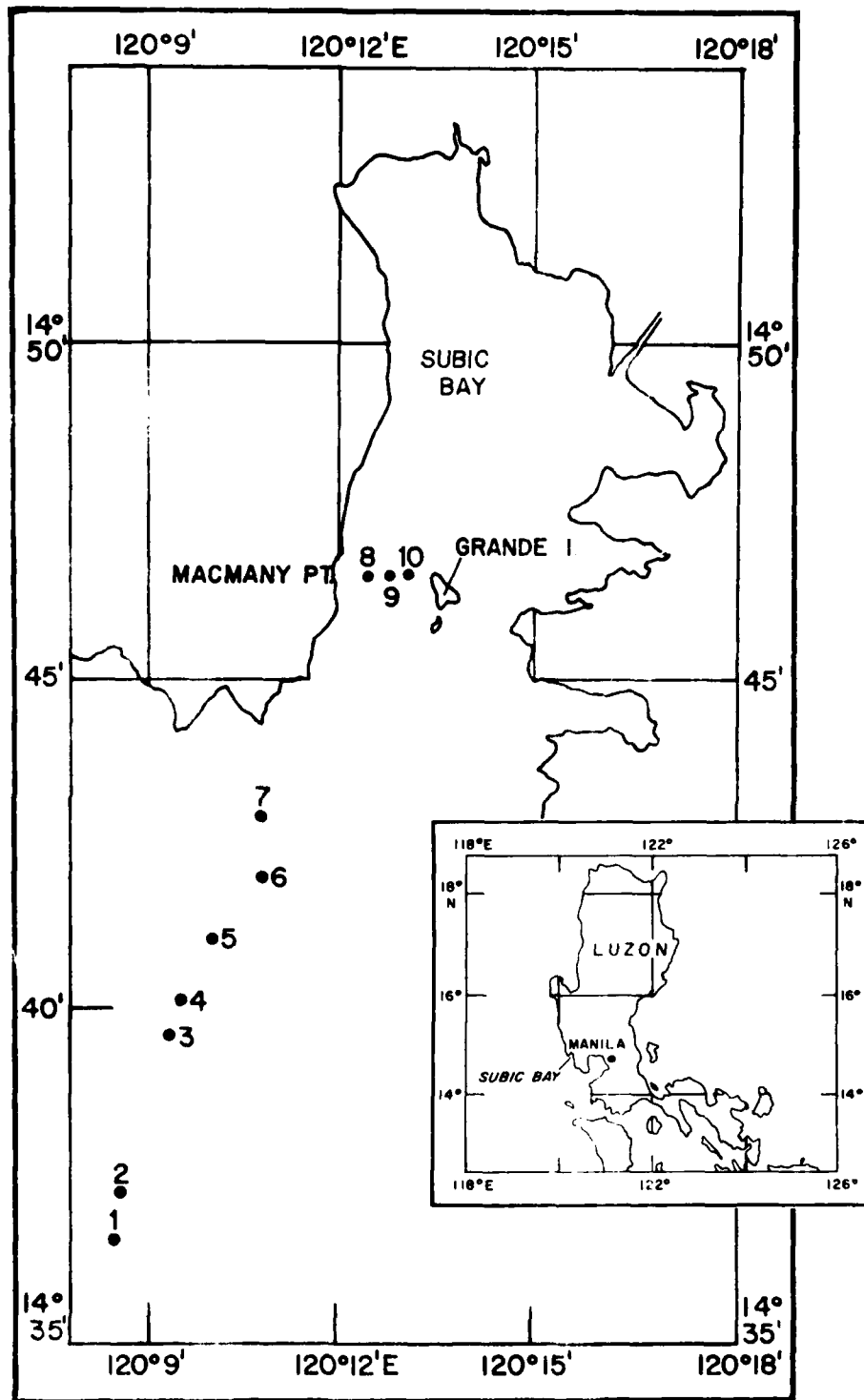


Figure 1. Station Locations

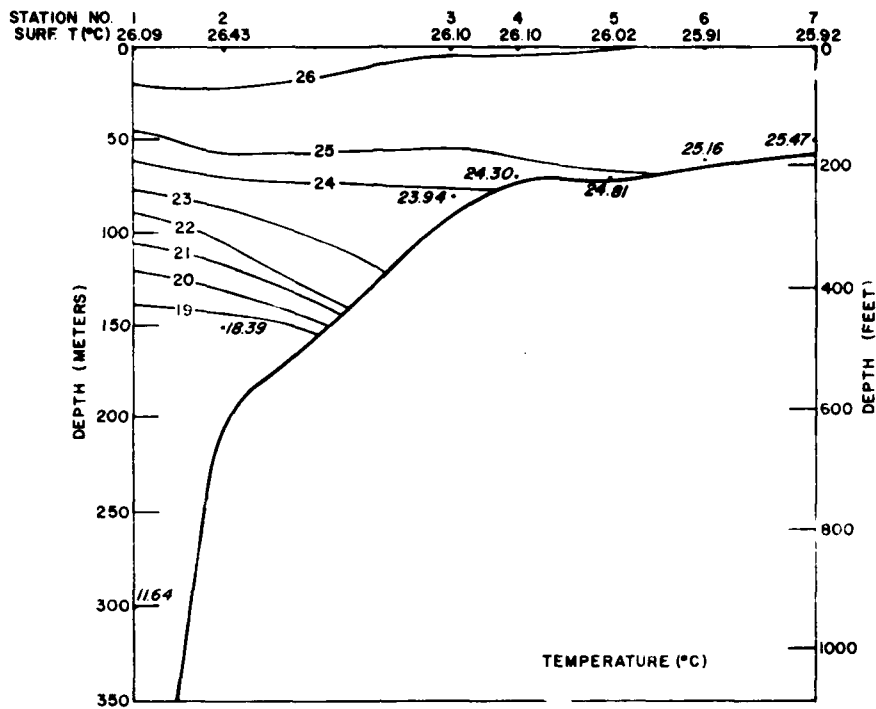


Figure 2. Temperature Cross Section - Stations 1 to 7

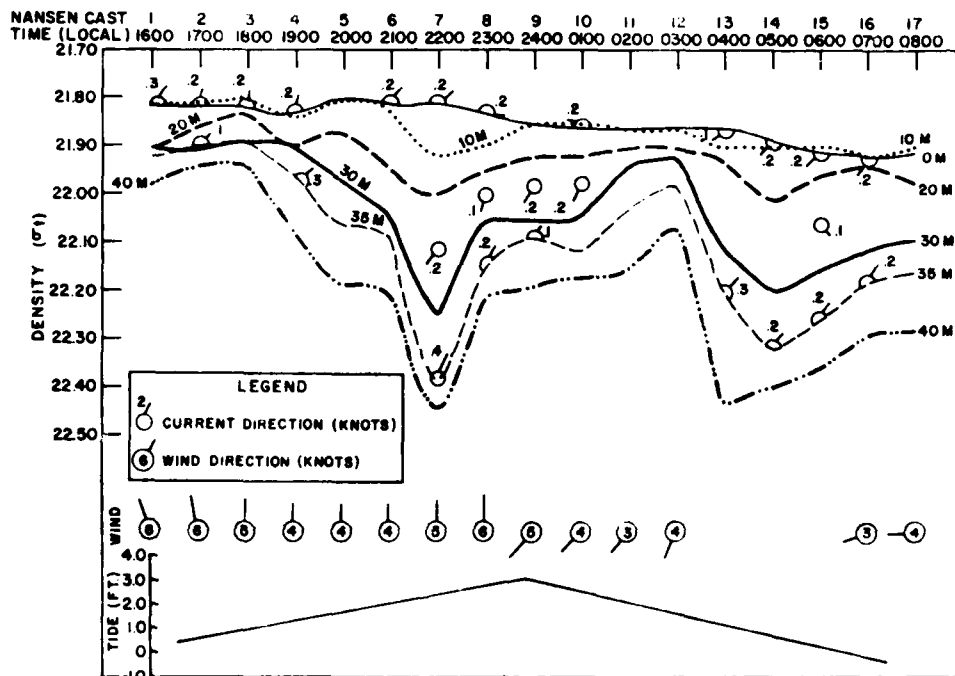


Figure 3. Density-Time-Depth Composite at Station 10

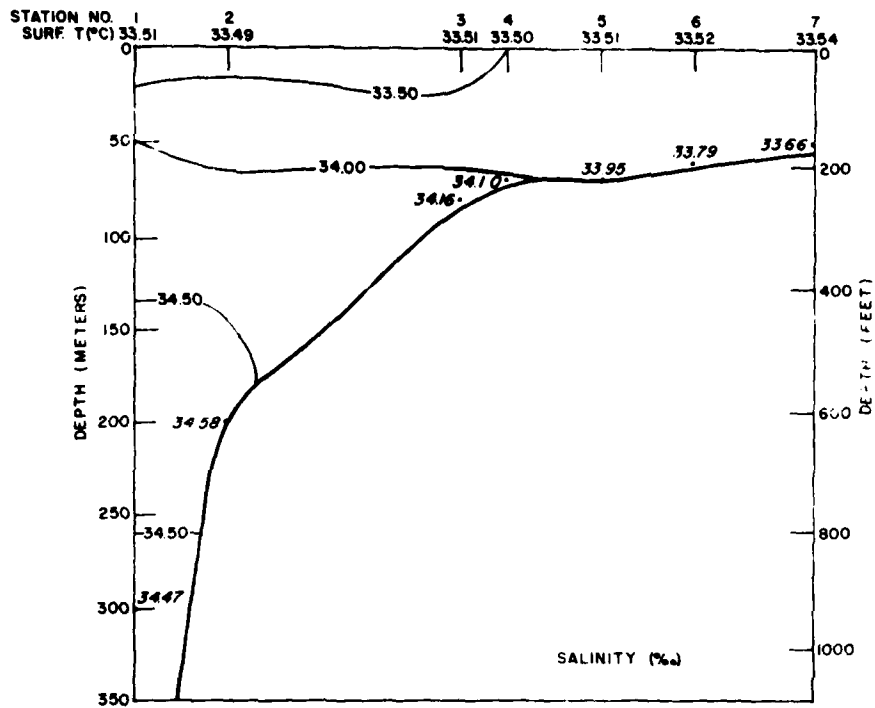


Figure 4. Salinity Cross Section - Stations 1 to 7

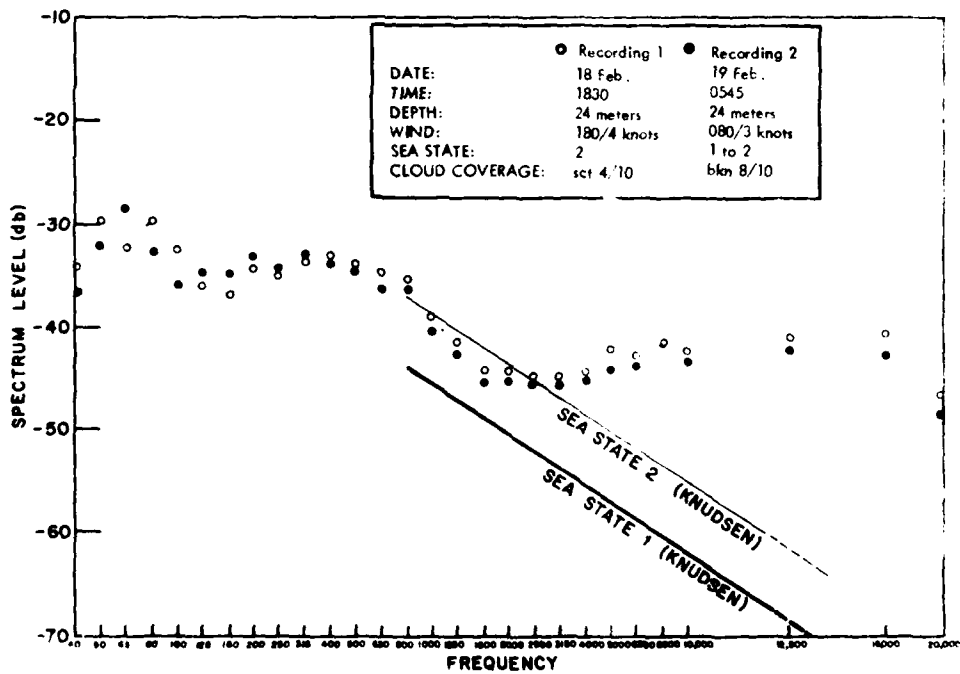


Figure 5. Sound Pressure Spectrum Level

TABLE I. STATION DATA SUMMARY

| Sta. No. | Latitude (°N) | Longitude (°E) | Depth (meters) | Nansen Casts | Current Meter Lowerings | Cores | Ambient Noise Recordings |
|----------|---------------|----------------|----------------|--------------|-------------------------|-------|--------------------------|
| 1 | 14°36.30' | 120°08.60' | 713 | 1 | | | |
| 2 | 14°37.25' | 120°08.70' | 205 | 1 | | | |
| 3 | 14°39.60' | 120°09.30' | 91 | 1 | | | |
| 4 | 14°40.20' | 120°09.70' | 73 | 1 | | | |
| 5 | 14°41.05' | 120°10.20' | 73 | 1 | | | |
| 6 | 14°42.00' | 120°10.50' | 64 | 1 | | | |
| 7 | 14°43.00' | 120°11.25' | 58 | 1 | | | |
| 8 | 14°46.60' | 120°12.30' | 60 | 1 | 1 | 1 | |
| 9 | 14°46.60' | 120°12.60' | 55 | 24 | 17 | 1 | |
| 10 | 14°46.60' | 120°12.90' | 43 | 17 | 15 | 1 | 2 |

APPENDIX A

Oceanographic Station Data

EXPLANATION OF COMPUTER DATA SHEET
OCEANOGRAPHIC STATION DATA

1. CRUISE. A number assigned to each cruise for identification purposes. The first two digits are the mine division number, the next three digits are the ship's hull number, and the last digit is the end digit of the year.
2. STATION. The station identification consists of an area abbreviation (SEA = Southeast Asia), a region number, and a consecutive station number for the cruise.
3. LATITUDE. Expressed in degrees, minutes, and tenths of minutes.
4. LONGITUDE. Expressed in degrees, minutes, and tenths of minutes.
5. MARSDEN SQUARE. A 10-degree geographical square used for cataloging data.
6. DATE. Day, month, and year when data were taken.
7. TIME. Time of day when data were taken in local time.
8. ZONE. Time zone for converting local time to GMT.
9. DEPTH. Depth of water in meters where station was taken.
10. AIR TEMP. Temperature of the air in °F when station was taken.
11. TEMP INSTR. Type of temperature recording instrument used for collecting the water temperatures (RTH= reversing oceanographic thermometer, MBT= mechanical bathythermograph).
12. SAL INSTR. Type of instrument used to obtain salinity samples of water (NAN= Nansen bottle).
13. DEPTH. Depth in meters at which each temperature and salinity sampling was made.
14. DEV. The + range of depth over which actual sampling depth may deviate from given sampling depth.
15. TEMP. Water temperature in °C at each sampling depth.
16. DEV. The + range of temperature over which actual temperature may deviate from given temperature value.
17. SALINITY. Water salinity in parts per thousand at each sampling depth.

18. DEV. The + range of salinity over which actual salinity may deviate from the given value.
19. ELEC. COND. The electrical conductivity of the water in mhos/cm² calculated from the values of temperature and salinity with the empirical equation of Ribe and Howe, "An Empirical Equation Relating Sea Water Salinity, Temperature, Pressure, and Electrical Conductivity."
20. DEV. The + range of electrical conductivity over which the actual conductivity may deviate from the given value, computed from the deviations of temperature and salinity.
21. SIGMA-T. An abbreviated expression for density (density= Sigma-t/1000 + 1) g/cm³ calculated with the equation of Knudsen using the given temperature and salinity values.
22. DEV. The + range of Sigma-t over which the actual Sigma-t may deviate from the given value, computed from the deviations of temperature and salinity.
23. SOUND VEL. The velocity of sound in sea water at each depth, in meters per second, calculated from the given values of depth, temperature, and salinity using Wilson's equations of 1960, NAVOCEANO Special Publication 58, "Tables of Sound Speed in Sea Water."
24. DEV. The + range of sound velocity over which the actual sound velocity may deviate from the given value, computed from the deviations of depth, temperature, and salinity.

CRUISE 924365 STATION SEA 4 1 LATITUDE 14 36.3 N LONGITUDE 120 8.6 E MARSDEN SQUARE 0
 DATE 22 JAN 69 TIME 1050 ZONE -8 DEPTH 713 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0 | 1.00 | 26.1 | 0.02 | 33.51 | 0.01 | 0.0521 | 0.0000 | 21.90 | 0.00 | 1535.7 | 0.07 |
| 10 | 1.00 | 26.0 | 0.02 | 33.51 | 0.01 | 0.0521 | 0.0000 | 21.92 | 0.00 | 1535.7 | 0.07 |
| 20 | 1.00 | 26.0 | 0.02 | 33.50 | 0.01 | 0.0520 | 0.0000 | 21.93 | 0.00 | 1535.8 | 0.07 |
| 30 | 1.00 | 26.0 | 0.02 | 33.51 | 0.01 | 0.0520 | 0.0000 | 21.94 | 0.00 | 1536.0 | 0.07 |
| 40 | 1.00 | 24.7 | 0.02 | 34.24 | 0.01 | 0.0514 | 0.0000 | 22.74 | 0.00 | 1533.8 | 0.08 |
| 70 | 1.00 | 23.1 | 0.02 | 34.27 | 0.01 | 0.0503 | 0.0000 | 23.33 | 0.00 | 1531.0 | 0.08 |
| 100 | 1.00 | 21.2 | 0.02 | 34.42 | 0.01 | 0.0494 | 0.0000 | 24.03 | 0.00 | 1526.2 | 0.08 |
| 150 | 1.00 | 18.2 | 0.02 | 34.55 | 0.01 | 0.0485 | 0.0000 | 24.90 | 0.00 | 1519.0 | 0.09 |
| 200 | 1.00 | 15.0 | 0.02 | 34.54 | 0.01 | 0.0484 | 0.0000 | 25.66 | 0.00 | 1510.0 | 0.09 |
| 242 | 1.00 | 13.2 | 0.02 | 34.51 | 0.01 | 0.0487 | 0.0000 | 25.98 | 0.00 | 1505.0 | 0.10 |
| 300 | 1.00 | 11.6 | 0.02 | 34.47 | 0.01 | 0.0481 | 0.0000 | 26.26 | 0.00 | 1500.5 | 0.10 |
| 400 | 1.00 | 9.7 | 0.02 | 34.23 | 0.01 | 0.0463 | 0.0000 | 26.74 | 0.00 | 1492.4 | 0.10 |

CRUISE 924365 STATION SEA 4 2 LATITUDE 14 37.2 N LONGITUDE 120 8.7 E MARSDEN SQUARE 0
 DATE 22 JAN 69 TIME 1240 ZONE -8 DEPTH 20 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0 | 1.00 | 26.4 | 0.02 | 33.49 | 0.01 | 0.0524 | 0.0000 | 21.78 | 0.00 | 1536.5 | 0.07 |
| 10 | 1.00 | 26.1 | 0.02 | 33.49 | 0.01 | 0.0521 | 0.0000 | 21.88 | 0.00 | 1535.9 | 0.07 |
| 20 | 1.00 | 26.1 | 0.02 | 33.51 | 0.01 | 0.0521 | 0.0000 | 21.91 | 0.00 | 1536.0 | 0.07 |
| 30 | 1.00 | 26.0 | 0.02 | 33.52 | 0.01 | 0.0520 | 0.0000 | 21.96 | 0.00 | 1535.9 | 0.07 |
| 50 | 1.00 | 23.6 | 0.02 | 33.64 | 0.01 | 0.0518 | 0.0000 | 22.15 | 0.00 | 1535.5 | 0.07 |
| 75 | 1.00 | 23.7 | 0.02 | 34.23 | 0.01 | 0.0506 | 0.0000 | 23.14 | 0.00 | 1532.0 | 0.08 |
| 100 | 1.00 | 22.5 | 0.02 | 34.35 | 0.01 | 0.0496 | 0.0000 | 23.61 | 0.00 | 1529.5 | 0.08 |
| 150 | 1.00 | 18.4 | 0.02 | 34.54 | 0.01 | 0.0487 | 0.0000 | 24.84 | 0.00 | 1519.5 | 0.09 |
| 200 | 1.00 | 10.0 | 0.02 | 34.58 | 0.01 | 0.0487 | 0.0000 | 27.79 | 0.01 | 1452.0 | 0.03 |

CRUISE 924365 STATION SEA 4 3 LATITUDE 14 39.6 N LONGITUDE 120 9.3 E MARSDEN SQUARE 0
 DATE 22 JAN 69 TIME 1350 ZONE -8 DEPTH 91 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0 | 1.00 | 26.1 | 0.02 | 33.51 | 0.01 | 0.0521 | 0.0000 | 21.90 | 0.00 | 1535.7 | 0.07 |
| 10 | 1.00 | 25.9 | 0.02 | 33.50 | 0.01 | 0.0519 | 0.0000 | 21.96 | 0.00 | 1535.4 | 0.07 |
| 20 | 1.00 | 25.9 | 0.02 | 33.52 | 0.01 | 0.0519 | 0.0000 | 21.97 | 0.00 | 1535.6 | 0.07 |
| 30 | 1.00 | 25.9 | 0.02 | 33.52 | 0.01 | 0.0519 | 0.0000 | 21.97 | 0.00 | 1535.9 | 0.07 |
| 50 | 1.00 | 24.7 | 0.02 | 33.48 | 0.01 | 0.0514 | 0.0000 | 22.68 | 0.00 | 1534.0 | 0.08 |
| 100 | 1.00 | 23.7 | 0.02 | 34.16 | 0.01 | 0.0504 | 0.0000 | 23.05 | 0.00 | 1532.7 | 0.08 |

CRUISE 924365 STATION SEA 4 4 LATITUDE 14 40.2 N LONGITUDE 120 9.7 E MARSDEN SQUARE 0
 DATE 22 JAN 65 TIME 1425 ZONE -8 DEPTH 73 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.1 | 0.02 | 33.50 | 0.01 | 0.0521 | 0.0000 | 21.89 | 0.00 | 1535.7 | 0.07 |
| 10. | 1.00 | 25.9 | 0.02 | 33.50 | 0.01 | 0.0519 | 0.0000 | 21.95 | 0.00 | 1535.5 | 0.07 |
| 20. | 1.00 | 25.9 | 0.02 | 33.50 | 0.01 | 0.0519 | 0.0000 | 21.97 | 0.00 | 1535.6 | 0.07 |
| 30. | 1.00 | 25.8 | 0.02 | 33.51 | 0.01 | 0.0519 | 0.0000 | 21.98 | 0.00 | 1535.8 | 0.07 |
| 40. | 1.00 | 25.4 | 0.02 | 33.73 | 0.01 | 0.0517 | 0.0000 | 22.29 | 0.00 | 1535.2 | 0.07 |
| 70. | 1.00 | 24.3 | 0.02 | 34.10 | 0.01 | 0.0511 | 0.0000 | 22.89 | 0.00 | 1533.3 | 0.08 |

CRUISE 924365 STATION SEA 4 5 LATITUDE 14 41.0 N LONGITUDE 120 10.2 E MARSDEN SQUARE 0
 DATE 22 JAN 65 TIME 1500 ZONE -8 DEPTH 73 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.0 | 0.02 | 33.51 | 0.01 | 0.0521 | 0.0000 | 21.93 | 0.00 | 1535.5 | 0.07 |
| 10. | 1.00 | 25.9 | 0.02 | 33.51 | 0.01 | 0.0520 | 0.0000 | 21.96 | 0.00 | 1535.5 | 0.07 |
| 20. | 1.00 | 25.9 | 0.02 | 33.51 | 0.01 | 0.0519 | 0.0000 | 21.98 | 0.00 | 1535.6 | 0.07 |
| 40. | 1.00 | 25.7 | 0.02 | 33.56 | 0.01 | 0.0518 | 0.0000 | 22.05 | 0.00 | 1535.6 | 0.07 |
| 50. | 1.00 | 25.6 | 0.02 | 33.52 | 0.01 | 0.0518 | 0.0000 | 22.13 | 0.00 | 1535.7 | 0.07 |
| 70. | 1.00 | 24.3 | 0.02 | 33.95 | 0.01 | 0.0514 | 0.0000 | 22.63 | 0.00 | 1534.4 | 0.08 |

CRUISE 924365 STATION SEA 4 6 LATITUDE 14 42.0 N LONGITUDE 120 10.5 E MARSDEN SQUARE 0
 DATE 22 JAN 65 TIME 1535 ZONE -8 DEPTH 64 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 25.9 | 0.02 | 33.52 | 0.01 | 0.0520 | 0.0000 | 21.97 | 0.00 | 1535.3 | 0.07 |
| 10. | 1.00 | 25.8 | 0.02 | 33.52 | 0.01 | 0.0519 | 0.0000 | 21.99 | 0.00 | 1535.3 | 0.07 |
| 20. | 1.00 | 25.8 | 0.02 | 33.52 | 0.01 | 0.0518 | 0.0000 | 22.01 | 0.00 | 1535.4 | 0.07 |
| 30. | 1.00 | 25.6 | 0.02 | 33.59 | 0.01 | 0.0517 | 0.0000 | 22.11 | 0.00 | 1535.3 | 0.07 |
| 40. | 1.00 | 25.6 | 0.02 | 33.61 | 0.01 | 0.0518 | 0.0000 | 22.13 | 0.00 | 1535.5 | 0.07 |
| 50. | 1.00 | 25.2 | 0.02 | 33.79 | 0.01 | 0.0516 | 0.0000 | 22.40 | 0.00 | 1534.8 | 0.07 |

CRUISE 924365 STATION SEA 4 7 LATITUDE 14 43.0 N LONGITUDE 120 11.2 E MARSDEN SQUARE 0
 DATE 22 JAN 65 TIME 1605 ZONE -8 DEPTH 58 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | STGMA-Y | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0 | 1.00 | 25.9 | 0.02 | 33.54 | 0.01 | 0.0520 | 0.0000 | 21.99 | 0.00 | 1535.3 | 0.07 |
| 10 | 1.00 | 25.9 | 0.02 | 33.54 | 0.01 | 0.0519 | 0.0000 | 22.00 | 0.00 | 1535.4 | 0.07 |
| 20 | 1.00 | 25.8 | 0.02 | 33.55 | 0.01 | 0.0518 | 0.0000 | 22.04 | 0.00 | 1535.3 | 0.07 |
| 30 | 1.00 | 25.7 | 0.02 | 33.54 | 0.01 | 0.0517 | 0.0000 | 22.06 | 0.00 | 1535.2 | 0.07 |
| 40 | 1.00 | 25.5 | 0.02 | 33.61 | 0.01 | 0.0517 | 0.0000 | 22.15 | 0.00 | 1535.2 | 0.07 |
| 50 | 1.00 | 25.5 | 0.02 | 33.66 | 0.01 | 0.0517 | 0.0000 | 22.21 | 0.00 | 1535.3 | 0.07 |

CRUISE 965 STATION SEA 4 3 LATITUDE 14 46.6 N LONGITUDE 120 12.3 E MARSDEN SQUARE 0
 DATE 19 FEB 65 TIME 1340 ZONE -8 DEPTH 60 AIR TEMP 80.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | STGMA-Y | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0 | 1.00 | 26.8 | 0.02 | 33.52 | 0.01 | 0.0528 | 0.0000 | 21.70 | 0.00 | 1537.3 | 0.07 |
| 15 | 1.00 | 26.5 | 0.02 | 33.52 | 0.01 | 0.0525 | 0.0000 | 21.80 | 0.00 | 1536.8 | 0.07 |
| 25 | 1.00 | 26.4 | 0.02 | 33.52 | 0.01 | 0.0524 | 0.0000 | 21.82 | 0.00 | 1536.8 | 0.07 |
| 35 | 1.00 | 26.2 | 0.02 | 33.57 | 0.01 | 0.0523 | 0.0000 | 21.93 | 0.00 | 1536.5 | 0.07 |
| 45 | 1.00 | 25.5 | 0.02 | 33.74 | 0.01 | 0.0518 | 0.0000 | 22.26 | 0.00 | 1535.3 | 0.07 |
| 55 | 1.00 | 25.0 | 0.02 | 33.86 | 0.01 | 0.0515 | 0.0000 | 22.50 | 0.00 | 1534.5 | 0.08 |

CRUISE 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 1140 ZONE -3 DEPTH 55 AIR TEMP 86.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | STGMA-Y | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0 | 1.00 | 26.3 | 0.02 | 33.55 | 0.01 | 0.0524 | 0.0000 | 21.88 | 0.00 | 1536.2 | 0.07 |
| 7 | 1.00 | 26.2 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.89 | 0.00 | 1536.2 | 0.07 |
| 15 | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.92 | 0.00 | 1536.1 | 0.07 |
| 25 | 1.00 | 25.9 | 0.02 | 33.60 | 0.01 | 0.0522 | 0.0000 | 22.00 | 0.00 | 1536.0 | 0.07 |
| 35 | 1.00 | 25.6 | 0.02 | 33.65 | 0.01 | 0.0519 | 0.0000 | 22.20 | 0.00 | 1535.3 | 0.07 |
| 50 | 1.00 | 24.8 | 0.02 | 33.89 | 0.01 | 0.0513 | 0.0000 | 22.60 | 0.00 | 1533.8 | 0.08 |

CRUISE — 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 1310 ZONE -8 DEPTH 55 AIR TEMP 85.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.55 | 0.01 | 0.0525 | 0.0000 | 21.83 | 0.00 | 1536.6 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.56 | 0.01 | 0.0522 | 0.0000 | 21.93 | 0.00 | 1536.1 | 0.07 |
| 25. | 1.00 | 26.1 | 0.02 | 33.57 | 0.01 | 0.0522 | 0.0000 | 21.95 | 0.00 | 1536.1 | 0.07 |
| 30. | 1.00 | 26.0 | 0.02 | 33.59 | 0.01 | 0.0522 | 0.0000 | 21.99 | 0.00 | 1536.1 | 0.07 |
| 35. | 1.00 | 25.6 | 0.02 | 33.67 | 0.01 | 0.0519 | 0.0000 | 22.18 | 0.00 | 1535.3 | 0.07 |
| 50. | 1.00 | 24.8 | 0.02 | 33.89 | 0.01 | 0.0514 | 0.0000 | 22.57 | 0.00 | 1534.0 | 0.08 |

CRUISE — 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 1400 ZONE -8 DEPTH 55 AIR TEMP 85.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.5 | 0.02 | 33.56 | 0.01 | 0.0526 | 0.0000 | 21.80 | 0.00 | 1536.8 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.92 | 0.00 | 1536.1 | 0.07 |
| 25. | 1.00 | 26.1 | 0.02 | 33.57 | 0.01 | 0.0522 | 0.0000 | 21.95 | 0.00 | 1536.2 | 0.07 |
| 30. | 1.00 | 26.1 | 0.02 | 33.59 | 0.01 | 0.0522 | 0.0000 | 21.97 | 0.00 | 1536.2 | 0.07 |
| 35. | 1.00 | 25.6 | 0.02 | 33.68 | 0.01 | 0.0519 | 0.0000 | 22.18 | 0.00 | 1535.4 | 0.07 |
| 50. | 1.00 | 25.0 | 0.00 | 33.87 | 0.01 | 0.0522 | 0.0000 | 27.22 | 0.01 | 1448.6 | 0.03 |

CRUISE — 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 1500 ZONE -8 DEPTH 55 AIR TEMP 84.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.55 | 0.01 | 0.0525 | 0.0000 | 21.83 | 0.00 | 1536.6 | 0.07 |
| 15. | 1.00 | 26.2 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.92 | 0.00 | 1536.1 | 0.07 |
| 25. | 1.00 | 26.1 | 0.02 | 33.56 | 0.01 | 0.0522 | 0.0000 | 21.94 | 0.00 | 1536.2 | 0.07 |
| 30. | 1.00 | 26.1 | 0.02 | 33.59 | 0.01 | 0.0522 | 0.0000 | 21.97 | 0.00 | 1536.2 | 0.07 |
| 35. | 1.00 | 25.6 | 0.02 | 33.69 | 0.01 | 0.0519 | 0.0000 | 22.18 | 0.00 | 1535.4 | 0.07 |
| 50. | 1.00 | 25.0 | 0.02 | 33.87 | 0.01 | 0.0515 | 0.0000 | 22.52 | 0.00 | 1534.3 | 0.08 |

CRUISE — 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E PARSCEN SQUARE 0
 DATE 17 FEB 65 TIME 1900 ZONE -9 DEPTH 55 AIR TEMP 82.0 TEMP INSTR RTH SAL INSTR MAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.89 | 0.00 | 1535.9 | 0.07 |
| 15. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.88 | 0.00 | 1536.2 | 0.07 |
| 25. | 1.00 | 26.2 | 0.02 | 33.53 | 0.01 | 0.0522 | 0.0000 | 21.90 | 0.00 | 1536.3 | 0.07 |
| 30. | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.93 | 0.00 | 1536.3 | 0.07 |
| 35. | 1.00 | 25.7 | 0.02 | 33.63 | 0.01 | 0.0519 | 0.0000 | 22.12 | 0.00 | 1535.5 | 0.07 |
| 50. | 1.00 | 25.5 | 0.02 | 33.81 | 0.01 | 0.0515 | 0.0000 | 22.45 | 0.00 | 1534.4 | 0.08 |

CRUISE — 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E PARSCEN SQUARE 0
 DATE 17 FEB 65 TIME 1700 ZONE -8 DEPTH 55 AIR TEMP 82.0 TEMP INSTR RTH SAL INSTR MAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.5 | 0.02 | 33.55 | 0.01 | 0.0526 | 0.0000 | 21.81 | 0.00 | 1536.6 | 0.07 |
| 15. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.89 | 0.00 | 1536.1 | 0.07 |
| 25. | 1.00 | 26.1 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.90 | 0.00 | 1536.3 | 0.07 |
| 30. | 1.00 | 26.1 | 0.02 | 33.53 | 0.01 | 0.0522 | 0.0000 | 21.91 | 0.00 | 1536.3 | 0.07 |
| 35. | 1.00 | 25.7 | 0.02 | 33.62 | 0.01 | 0.0519 | 0.0000 | 22.11 | 0.00 | 1535.5 | 0.07 |
| 50. | 1.00 | 25.1 | 0.02 | 33.79 | 0.01 | 0.0515 | 0.0000 | 22.43 | 0.00 | 1534.4 | 0.08 |

CRUISE — 965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E PARSCEN SQUARE 0
 DATE 17 FEB 65 TIME 1900 ZONE -9 DEPTH 55 AIR TEMP 82.0 TEMP INSTR RTH SAL INSTR MAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.3 | 0.02 | 33.51 | 0.01 | 0.0523 | 0.0000 | 21.84 | 0.00 | 1536.2 | 0.07 |
| 15. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.88 | 0.00 | 1536.2 | 0.07 |
| 25. | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.92 | 0.00 | 1536.3 | 0.07 |
| 30. | 1.00 | 25.9 | 0.02 | 33.61 | 0.01 | 0.0521 | 0.0000 | 22.03 | 0.00 | 1535.9 | 0.07 |
| 35. | 1.00 | 25.6 | 0.02 | 33.64 | 0.01 | 0.0518 | 0.0000 | 22.16 | 0.00 | 1535.3 | 0.07 |
| 50. | 1.00 | 25.1 | 0.02 | 33.78 | 0.01 | 0.0515 | 0.0000 | 22.41 | 0.00 | 1534.5 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 2000 ZCNE -8 DEPTH 55 AIR TEMP 81.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. | COND. | DEV. | SIGMA-T | DEV. | SOUND | VEL. | DEV. |
|-------|------|------|------|----------|------|--------|--------|--------|---------|------|--------|------|------|
| 5. | 1.00 | 26.3 | 0.02 | 33.53 | 0.01 | 0.0524 | 0.0000 | 0.0000 | 21.85 | 0.00 | 1536.3 | 0.07 | |
| 15. | 1.00 | 26.2 | 0.02 | 33.53 | 0.01 | 0.0523 | 0.0000 | 0.0000 | 21.88 | 0.00 | 1536.3 | 0.07 | |
| 25. | 1.00 | 26.2 | 0.02 | 33.56 | 0.01 | 0.0523 | 0.0000 | 0.0000 | 21.92 | 0.00 | 1536.4 | 0.07 | |
| 35. | 1.00 | 25.8 | 0.02 | 33.60 | 0.01 | 0.0520 | 0.0000 | 0.0000 | 22.06 | 0.00 | 1535.6 | 0.07 | |
| 50. | 1.00 | 25.6 | 0.02 | 33.66 | 0.01 | 0.0518 | 0.0000 | 0.0000 | 22.18 | 0.00 | 1535.3 | 0.07 | |
| 55. | 1.00 | 24.9 | 0.02 | 33.82 | 0.01 | 0.0514 | 0.0000 | 0.0000 | 22.50 | 0.00 | 1534.1 | 0.08 | |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 2100 ZCNE -8 DEPTH 55 AIR TEMP 81.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. | COND. | DEV. | SIGMA-T | DEV. | SOUND | VEL. | DEV. |
|-------|------|------|------|----------|------|--------|--------|--------|---------|------|--------|------|------|
| 5. | 1.00 | 26.5 | 0.02 | 33.51 | 0.01 | 0.0525 | 0.0000 | 0.0000 | 21.79 | 0.00 | 1536.6 | 0.07 | |
| 15. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 0.0000 | 21.88 | 0.00 | 1536.2 | 0.07 | |
| 25. | 1.00 | 26.0 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 0.0000 | 21.96 | 0.00 | 1536.0 | 0.07 | |
| 35. | 1.00 | 25.8 | 0.02 | 33.59 | 0.01 | 0.0519 | 0.0000 | 0.0000 | 22.07 | 0.00 | 1535.5 | 0.07 | |
| 50. | 1.00 | 25.5 | 0.02 | 33.65 | 0.01 | 0.0518 | 0.0000 | 0.0000 | 22.18 | 0.00 | 1535.2 | 0.07 | |
| 55. | 1.00 | 24.9 | 0.02 | 33.83 | 0.01 | 0.0514 | 0.0000 | 0.0000 | 22.50 | 0.00 | 1534.2 | 0.08 | |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 2200 ZCNE -8 DEPTH 55 AIR TEMP 80.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. | COND. | DEV. | SIGMA-T | DEV. | SOUND | VEL. | DEV. |
|-------|------|------|------|----------|------|--------|--------|--------|---------|------|--------|------|------|
| 5. | 1.00 | 26.5 | 0.02 | 33.51 | 0.01 | 0.0525 | 0.0000 | 0.0000 | 21.78 | 0.00 | 1536.6 | 0.07 | |
| 15. | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 0.0000 | 21.94 | 0.00 | 1535.9 | 0.07 | |
| 25. | 1.00 | 26.0 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 0.0000 | 21.97 | 0.00 | 1535.9 | 0.07 | |
| 35. | 1.00 | 25.9 | 0.02 | 33.57 | 0.01 | 0.0520 | 0.0000 | 0.0000 | 22.02 | 0.00 | 1535.8 | 0.07 | |
| 50. | 1.00 | 25.4 | 0.02 | 33.66 | 0.01 | 0.0517 | 0.0000 | 0.0000 | 22.22 | 0.00 | 1534.9 | 0.07 | |
| 55. | 1.00 | 25.0 | 0.02 | 33.79 | 0.01 | 0.0514 | 0.0000 | 0.0000 | 22.44 | 0.00 | 1534.4 | 0.08 | |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 17 FEB 65 TIME 2300 ZONE -8 DEPTH 55 AIR TEMP 79.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.51 | 0.01 | 0.0525 | 0.0000 | 21.80 | 0.00 | 1536.5 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 21.94 | 0.00 | 1535.9 | 0.07 |
| 25. | 1.00 | 26.0 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 21.96 | 0.00 | 1536.0 | 0.07 |
| 30. | 1.00 | 25.9 | 0.02 | 33.58 | 0.01 | 0.0519 | 0.0000 | 22.04 | 0.00 | 1535.7 | 0.07 |
| 35. | 1.00 | 25.7 | 0.02 | 33.65 | 0.01 | 0.0517 | 0.0000 | 22.19 | 0.00 | 1535.1 | 0.07 |
| 50. | 1.00 | 25.5 | 0.02 | 33.80 | 0.01 | 0.0514 | 0.0000 | 22.45 | 0.00 | 1534.3 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 0900 ZONE -8 DEPTH 55 AIR TEMP 78.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.51 | 0.01 | 0.0524 | 0.0000 | 21.81 | 0.00 | 1536.4 | 0.07 |
| 15. | 1.00 | 26.0 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 21.95 | 0.00 | 1535.9 | 0.07 |
| 25. | 1.00 | 26.0 | 0.02 | 33.55 | 0.01 | 0.0521 | 0.0000 | 21.96 | 0.00 | 1536.0 | 0.07 |
| 30. | 1.00 | 25.9 | 0.02 | 33.58 | 0.01 | 0.0519 | 0.0000 | 22.04 | 0.00 | 1535.7 | 0.07 |
| 35. | 1.00 | 25.7 | 0.02 | 33.65 | 0.01 | 0.0518 | 0.0000 | 22.17 | 0.00 | 1535.2 | 0.07 |
| 50. | 1.00 | 25.5 | 0.02 | 33.82 | 0.01 | 0.0514 | 0.0000 | 22.48 | 0.00 | 1534.3 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 0110 ZONE -8 DEPTH 55 AIR TEMP 78.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.3 | 0.02 | 33.54 | 0.01 | 0.0524 | 0.0000 | 21.86 | 0.00 | 1536.2 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.56 | 0.01 | 0.0522 | 0.0000 | 21.95 | 0.00 | 1536.0 | 0.07 |
| 25. | 1.00 | 26.0 | 0.02 | 33.58 | 0.01 | 0.0521 | 0.0000 | 21.99 | 0.00 | 1536.0 | 0.07 |
| 30. | 1.00 | 25.8 | 0.02 | 33.61 | 0.01 | 0.0519 | 0.0000 | 22.08 | 0.00 | 1535.6 | 0.07 |
| 35. | 1.00 | 25.7 | 0.02 | 33.64 | 0.01 | 0.0519 | 0.0000 | 22.14 | 0.00 | 1535.4 | 0.07 |
| 50. | 1.00 | 25.5 | 0.02 | 33.82 | 0.01 | 0.0514 | 0.0000 | 22.48 | 0.00 | 1534.3 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 0200 ZONE -8 DEPTH 55 AIR TEMP 76.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5. | 1.00 | 26.2 | 0.02 | 33.52 | 0.00 | 0.0523 | 0.0000 | 21.87 | -0.01 | 1536.0 | 0.06 |
| 15. | 1.00 | 26.1 | 0.02 | 33.55 | 0.00 | 0.0522 | 0.0000 | 21.93 | -0.01 | 1536.1 | 0.06 |
| 25. | 1.00 | 26.0 | 0.02 | 33.56 | 0.00 | 0.0521 | 0.0000 | 21.96 | -0.01 | 1536.0 | 0.06 |
| 35. | 1.00 | 25.9 | 0.02 | 33.59 | 0.01 | 0.0520 | 0.0000 | 22.03 | 0.00 | 1535.7 | 0.07 |
| 50. | 1.00 | 25.6 | 0.02 | 33.64 | 0.01 | 0.0518 | 0.0000 | 22.14 | 0.00 | 1535.4 | 0.07 |
| 50. | 1.00 | 25.0 | 0.02 | 33.82 | 0.01 | 0.0514 | 0.0000 | 22.48 | 0.00 | 1534.2 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 0300 ZONE -8 DEPTH 55 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 5. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.88 | 0.00 | 1536.0 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.94 | 0.00 | 1536.0 | 0.07 |
| 25. | 1.00 | 25.9 | 0.02 | 33.59 | 0.01 | 0.0520 | 0.0000 | 22.03 | 0.00 | 1535.7 | 0.07 |
| 35. | 1.00 | 25.7 | 0.02 | 33.61 | 0.01 | 0.0519 | 0.0000 | 22.09 | 0.00 | 1535.5 | 0.07 |
| 50. | 1.00 | 25.6 | 0.02 | 33.64 | 0.01 | 0.0518 | 0.0000 | 22.15 | 0.00 | 1535.3 | 0.07 |
| 50. | 1.00 | 25.0 | 0.02 | 33.83 | 0.01 | 0.0514 | 0.0000 | 22.49 | 0.00 | 1534.3 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 0400 ZONE -8 DEPTH 55 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 5. | 1.00 | 26.2 | 0.02 | 33.52 | 0.01 | 0.0522 | 0.0000 | 21.88 | 0.00 | 1536.0 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.56 | 0.01 | 0.0522 | 0.0000 | 21.95 | 0.00 | 1536.0 | 0.07 |
| 25. | 1.00 | 25.8 | 0.02 | 33.61 | 0.01 | 0.0519 | 0.0000 | 22.08 | 0.00 | 1535.5 | 0.07 |
| 30. | 1.00 | 25.7 | 0.02 | 33.62 | 0.01 | 0.0519 | 0.0000 | 22.11 | 0.00 | 1535.4 | 0.07 |
| 35. | 1.00 | 25.6 | 0.02 | 33.66 | 0.01 | 0.0518 | 0.0000 | 22.17 | 0.00 | 1535.3 | 0.07 |
| 50. | 1.00 | 25.0 | 0.02 | 33.82 | 0.01 | 0.0515 | 0.0000 | 22.46 | 0.00 | 1534.4 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0

DATE 18 FEB 65 TIME 0550 ZONE -9 DEPTH 55 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.53 | 0.01 | 0.0522 | 0.0000 | 21.89 | 0.00 | 1535.9 | 0.07 |
| 15. | 1.00 | 26.1 | 0.02 | 33.56 | 0.01 | 0.0522 | 0.0000 | 21.93 | 0.00 | 1536.1 | 0.07 |
| 25. | 1.00 | 25.9 | 0.02 | 33.67 | 0.01 | 0.0520 | 0.0000 | 22.04 | 0.00 | 1535.7 | 0.07 |
| 30. | 1.00 | 25.7 | 0.02 | 33.64 | 0.01 | 0.0519 | 0.0000 | 22.14 | 0.00 | 1535.4 | 0.07 |
| 35. | 1.00 | 25.6 | 0.02 | 33.66 | 0.01 | 0.0518 | 0.0000 | 22.17 | 0.00 | 1535.3 | 0.07 |
| 50. | 1.00 | 25.1 | 0.02 | 33.80 | 0.01 | 0.0516 | 0.0000 | 22.44 | 0.00 | 1534.4 | 0.07 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0

DATE 18 FEB 65 TIME 0600 ZONE -8 DEPTH 55 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.54 | 0.01 | 0.0522 | 0.0000 | 21.91 | 0.00 | 1535.9 | 0.07 |
| 15. | 1.00 | 26.2 | 0.02 | 33.58 | 0.01 | 0.0523 | 0.0000 | 21.94 | 0.00 | 1536.2 | 0.07 |
| 25. | 1.00 | 25.9 | 0.02 | 33.62 | 0.01 | 0.0520 | 0.0000 | 22.07 | 0.00 | 1535.6 | 0.07 |
| 30. | 1.00 | 25.6 | 0.02 | 33.64 | 0.01 | 0.0518 | 0.0000 | 22.15 | 0.00 | 1535.3 | 0.07 |
| 35. | 1.00 | 25.5 | 0.02 | 33.70 | 0.01 | 0.0518 | 0.0000 | 22.22 | 0.00 | 1535.2 | 0.07 |
| 50. | 1.00 | 24.9 | 0.02 | 33.86 | 0.01 | 0.0514 | 0.0000 | 22.54 | 0.00 | 1534.0 | 0.08 |

CRUISE —965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSDEN SQUARE 0

DATE 18 FEB 65 TIME 0700 ZONE -8 DEPTH 55 AIR TEMP 76.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.92 | 0.00 | 1535.9 | 0.07 |
| 15. | 1.00 | 26.2 | 0.02 | 33.56 | 0.01 | 0.0523 | 0.0000 | 21.92 | 0.00 | 1536.2 | 0.07 |
| 25. | 1.00 | 26.1 | 0.02 | 33.58 | 0.01 | 0.0522 | 0.0000 | 21.95 | 0.00 | 1536.2 | 0.07 |
| 30. | 1.00 | 25.7 | 0.02 | 33.64 | 0.01 | 0.0518 | 0.0000 | 22.12 | 0.00 | 1535.5 | 0.07 |
| 35. | 1.00 | 25.5 | 0.02 | 33.69 | 0.01 | 0.0518 | 0.0000 | 22.21 | 0.00 | 1535.2 | 0.07 |
| 50. | 1.00 | 24.9 | 0.02 | 33.87 | 0.01 | 0.0514 | 0.0000 | 22.55 | 0.00 | 1534.1 | 0.08 |

CRUISE — 165 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSCHEN SQUARE 0
 DATE 18 FEB 65 TIME 0930 ZONE -8 DEPTH 55 AIR TEMP 77.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|------|------------|------|
| 10 | 1.00 | 26.2 | 0.02 | 33.55 | 0.01 | 0.0522 | 0.0000 | 21.92 | 0.00 | 1535.9 | 0.07 |
| 15 | 1.00 | 26.2 | 0.02 | 33.56 | 0.01 | 0.0523 | 0.0000 | 21.92 | 0.00 | 1536.2 | 0.07 |
| 20 | 1.00 | 26.1 | 0.02 | 33.57 | 0.01 | 0.0522 | 0.0000 | 21.94 | 0.00 | 1536.3 | 0.07 |
| 25 | 1.00 | 25.9 | 0.02 | 33.62 | 0.01 | 0.0520 | 0.0000 | 22.07 | 0.00 | 1535.7 | 0.07 |
| 30 | 1.00 | 25.5 | 0.02 | 33.69 | 0.01 | 0.0518 | 0.0000 | 22.20 | 0.00 | 1535.3 | 0.07 |
| 35 | 1.00 | 24.7 | 0.02 | 33.87 | 0.01 | 0.0514 | 0.0000 | 22.55 | 0.00 | 1534.1 | 0.08 |

CRUISE — 165 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSCHEN SQUARE 0
 DATE 18 FEB 65 TIME 0930 ZONE -8 DEPTH 55 AIR TEMP 82.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 10 | 1.00 | 26.2 | 0.02 | 33.55 | 0.01 | 0.0523 | 0.0000 | 21.90 | -0.01 | 1536.0 | 0.06 |
| 15 | 1.00 | 26.2 | 0.02 | 33.55 | 0.00 | 0.0523 | 0.0000 | 21.90 | -0.01 | 1536.2 | 0.06 |
| 20 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.91 | -0.01 | 1536.3 | 0.06 |
| 25 | 1.00 | 25.9 | 0.02 | 33.61 | 0.00 | 0.0520 | 0.0000 | 22.05 | -0.01 | 1535.8 | 0.06 |
| 30 | 1.00 | 25.6 | 0.02 | 33.67 | 0.00 | 0.0519 | 0.0000 | 22.14 | -0.01 | 1535.3 | 0.06 |
| 35 | 1.00 | 24.7 | 0.02 | 33.86 | 0.00 | 0.0514 | 0.0000 | 22.54 | -0.01 | 1534.0 | 0.06 |

CRUISE — 165 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARSCHEN SQUARE 0
 DATE 18 FEB 65 TIME 1000 ZONE -8 DEPTH 55 AIR TEMP 85.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 10 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.90 | -0.01 | 1536.0 | 0.06 |
| 15 | 1.00 | 26.2 | 0.02 | 33.56 | 0.00 | 0.0523 | 0.0000 | 21.91 | -0.01 | 1536.2 | 0.06 |
| 20 | 1.00 | 26.2 | 0.02 | 33.55 | 0.00 | 0.0523 | 0.0000 | 21.91 | -0.01 | 1536.3 | 0.06 |
| 25 | 1.00 | 26.0 | 0.02 | 33.59 | 0.00 | 0.0522 | 0.0000 | 21.98 | -0.01 | 1536.2 | 0.06 |
| 30 | 1.00 | 25.7 | 0.02 | 33.65 | 0.00 | 0.0519 | 0.0000 | 22.15 | -0.01 | 1535.5 | 0.06 |
| 35 | 1.00 | 24.9 | 0.02 | 33.86 | 0.00 | 0.0513 | 0.0000 | 22.55 | -0.01 | 1534.0 | 0.06 |

CRUISE --965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARS DEN SQUARE 0
 DATE 15 FEB 65 TIME 1100 ZONE -8 DEPTH 55 AIR TEMP 85.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 10 | 1.00 | 26.2 | 0.02 | 33.55 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.1 | 0.06 |
| 15 | 1.00 | 26.2 | 0.02 | 33.56 | 0.00 | 0.0523 | 0.0000 | 21.92 | -0.01 | 1536.2 | 0.06 |
| 20 | 1.00 | 26.1 | 0.02 | 33.56 | 0.00 | 0.0522 | 0.0000 | 21.93 | -0.01 | 1536.3 | 0.06 |
| 30 | 1.00 | 26.1 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.97 | -0.01 | 1536.2 | 0.06 |
| 35 | 1.00 | 25.7 | 0.02 | 33.53 | 0.00 | 0.0519 | 0.0000 | 22.14 | -0.01 | 1535.5 | 0.06 |
| 50 | 1.00 | 24.9 | 0.02 | 33.85 | 0.00 | 0.0514 | 0.0000 | 22.54 | -0.01 | 1534.1 | 0.06 |

CRUISE --965 STATION SEA 4 9 LATITUDE 14 46.6 N LONGITUDE 120 12.6 E MARS DEN SQUARE 0
 DATE 14 FEB 65 TIME 1140 ZONE -8 DEPTH 55 AIR TEMP 86.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 10 | 1.00 | 26.2 | 0.02 | 33.55 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.1 | 0.06 |
| 15 | 1.00 | 26.2 | 0.02 | 33.56 | 0.00 | 0.0523 | 0.0000 | 21.91 | -0.01 | 1536.2 | 0.06 |
| 20 | 1.00 | 26.1 | 0.02 | 33.58 | 0.00 | 0.0523 | 0.0000 | 21.94 | -0.01 | 1536.3 | 0.06 |
| 30 | 1.00 | 26.1 | 0.02 | 33.53 | 0.00 | 0.0522 | 0.0000 | 21.96 | -0.01 | 1536.3 | 0.06 |
| 35 | 1.00 | 25.7 | 0.02 | 33.63 | 0.00 | 0.0519 | 0.0000 | 22.10 | -0.01 | 1535.6 | 0.06 |
| 50 | 1.00 | 24.9 | 0.02 | 33.86 | 0.00 | 0.0514 | 0.0000 | 22.54 | -0.01 | 1534.1 | 0.06 |

CRUISE --965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE 0
 DATE 18 FEB 65 TIME 1600 ZONE -8 DEPTH 43 AIR TEMP 82.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 10 | 1.00 | 26.5 | 0.02 | 33.54 | 0.00 | 0.0526 | 0.0000 | 21.81 | -0.01 | 1536.6 | 0.06 |
| 15 | 1.00 | 26.4 | 0.02 | 33.54 | 0.00 | 0.0525 | 0.0000 | 21.82 | -0.01 | 1536.7 | 0.06 |
| 20 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.4 | 0.06 |
| 30 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.91 | -0.01 | 1536.4 | 0.06 |
| 35 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.91 | -0.01 | 1536.5 | 0.06 |
| 40 | 1.00 | 26.1 | 0.02 | 33.57 | 0.00 | 0.0522 | 0.0000 | 21.97 | -0.01 | 1536.3 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE 0

DATE 18 FEB 65 TIME 1700 ZCNE -8 DEPTH 43 AIR TEMP 82.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5 | 1.00 | 26.4 | 0.02 | 33.52 | 0.00 | 0.0525 | 0.0000 | 21.82 | -0.01 | 1536.4 | 0.06 |
| 10 | 1.00 | 26.4 | 0.02 | 33.52 | 0.00 | 0.0525 | 0.0000 | 21.81 | -0.01 | 1536.6 | 0.06 |
| 20 | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.85 | -0.01 | 1536.6 | 0.06 |
| 30 | 1.00 | 26.2 | 0.02 | 33.53 | 0.00 | 0.0522 | 0.0000 | 21.90 | -0.01 | 1536.4 | 0.06 |
| 35 | 1.00 | 26.2 | 0.02 | 33.53 | 0.00 | 0.0522 | 0.0000 | 21.90 | -0.01 | 1536.5 | 0.06 |
| 40 | 1.00 | 26.1 | 0.02 | 33.54 | 0.00 | 0.0521 | 0.0000 | 21.93 | -0.01 | 1536.4 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE 0

DATE 18 FEB 65 TIME 1800 ZCNE -8 DEPTH 43 AIR TEMP 83.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5 | 1.00 | 26.4 | 0.02 | 33.52 | 0.00 | 0.0525 | 0.0000 | 21.81 | -0.01 | 1536.5 | 0.06 |
| 10 | 1.00 | 26.4 | 0.02 | 33.51 | 0.00 | 0.0525 | 0.0000 | 21.80 | -0.01 | 1536.7 | 0.06 |
| 20 | 1.00 | 26.4 | 0.02 | 33.52 | 0.00 | 0.0524 | 0.0000 | 21.82 | -0.01 | 1536.7 | 0.06 |
| 30 | 1.00 | 26.2 | 0.02 | 33.52 | 0.00 | 0.0522 | 0.0000 | 21.89 | -0.01 | 1536.4 | 0.06 |
| 35 | 1.00 | 26.2 | 0.02 | 33.52 | 0.00 | 0.0522 | 0.0000 | 21.89 | -0.01 | 1536.5 | 0.06 |
| 40 | 1.00 | 26.1 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.93 | -0.01 | 1536.4 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE 0

DATE 18 FEB 65 TIME 1900 ZCNE -8 DEPTH 43 AIR TEMP 80.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5 | 1.00 | 26.4 | 0.02 | 33.53 | 0.00 | 0.0525 | 0.0000 | 21.82 | -0.01 | 1536.5 | 0.06 |
| 10 | 1.00 | 26.4 | 0.02 | 33.54 | 0.00 | 0.0525 | 0.0000 | 21.83 | -0.01 | 1536.6 | 0.06 |
| 20 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.4 | 0.06 |
| 30 | 1.00 | 26.2 | 0.02 | 33.53 | 0.00 | 0.0522 | 0.0000 | 21.90 | -0.01 | 1536.4 | 0.06 |
| 35 | 1.00 | 26.0 | 0.02 | 33.55 | 0.00 | 0.0521 | 0.0000 | 21.95 | -0.01 | 1536.2 | 0.06 |
| 40 | 1.00 | 25.9 | 0.02 | 33.61 | 0.00 | 0.0520 | 0.0000 | 22.07 | -0.01 | 1535.8 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 2000 ZCNE -8 DEPTH 43 AIR TEMP 83.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. | COND. | DEV. | SIGMA-T | DEV. | SOUND | VEL. | DEV. |
|-------|------|------|------|----------|------|--------|--------|--------|---------|-------|--------|------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.51 | 0.00 | 0.0525 | 0.0000 | 0.0000 | 21.80 | -0.01 | 1536.5 | 0.06 | |
| 10. | 1.00 | 26.4 | 0.02 | 33.51 | 0.00 | 0.0525 | 0.0000 | 0.0000 | 21.80 | -0.01 | 1536.7 | 0.06 | |
| 20. | 1.00 | 26.2 | 0.02 | 33.51 | 0.00 | 0.0523 | 0.0000 | 0.0000 | 21.86 | -0.01 | 1536.3 | 0.06 | |
| 30. | 1.00 | 26.0 | 0.02 | 33.55 | 0.00 | 0.0520 | 0.0000 | 0.0000 | 21.98 | -0.01 | 1536.0 | 0.06 | |
| 35. | 1.00 | 25.8 | 0.02 | 33.59 | 0.00 | 0.0520 | 0.0000 | 0.0000 | 22.05 | -0.01 | 1535.8 | 0.06 | |
| 40. | 1.00 | 25.5 | 0.02 | 33.66 | 0.00 | 0.0518 | 0.0000 | 0.0000 | 22.18 | -0.01 | 1535.3 | 0.06 | |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 2100 ZCNE -8 DEPTH 43 AIR TEMP 80.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. | COND. | DEV. | SIGMA-T | DEV. | SOUND | VEL. | DEV. |
|-------|------|------|------|----------|------|--------|--------|--------|---------|-------|--------|------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.51 | 0.00 | 0.0524 | 0.0000 | 0.0000 | 21.81 | -0.01 | 1536.4 | 0.06 | |
| 10. | 1.00 | 26.4 | 0.02 | 33.51 | 0.00 | 0.0524 | 0.0000 | 0.0000 | 21.81 | -0.01 | 1536.6 | 0.06 | |
| 20. | 1.00 | 26.0 | 0.02 | 33.54 | 0.00 | 0.0521 | 0.0000 | 0.0000 | 21.94 | -0.01 | 1536.0 | 0.06 | |
| 30. | 1.00 | 25.9 | 0.02 | 33.58 | 0.00 | 0.0520 | 0.0000 | 0.0000 | 22.03 | -0.01 | 1535.8 | 0.06 | |
| 35. | 1.00 | 25.8 | 0.02 | 33.61 | 0.00 | 0.0519 | 0.0000 | 0.0000 | 22.08 | -0.01 | 1535.6 | 0.06 | |
| 40. | 1.00 | 25.5 | 0.02 | 33.66 | 0.00 | 0.0518 | 0.0000 | 0.0000 | 22.19 | -0.01 | 1535.2 | 0.06 | |

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CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 2200 ZCNE -8 DEPTH 43 AIR TEMP 79.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. | COND. | DEV. | SIGMA-T | DEV. | SOUND | VEL. | DEV. |
|-------|------|------|------|----------|------|--------|--------|--------|---------|-------|--------|------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.51 | 0.00 | 0.0524 | 0.0000 | 0.0000 | 21.81 | -0.01 | 1536.4 | 0.06 | |
| 10. | 1.00 | 26.1 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 0.0000 | 21.92 | -0.01 | 1535.9 | 0.06 | |
| 20. | 1.00 | 25.9 | 0.02 | 33.56 | 0.00 | 0.0520 | 0.0000 | 0.0000 | 22.00 | -0.01 | 1535.7 | 0.06 | |
| 30. | 1.00 | 25.4 | 0.02 | 33.68 | 0.00 | 0.0517 | 0.0000 | 0.0000 | 22.24 | -0.01 | 1534.8 | 0.06 | |
| 35. | 1.00 | 25.1 | 0.02 | 33.76 | 0.00 | 0.0515 | 0.0000 | 0.0000 | 22.38 | -0.01 | 1534.4 | 0.06 | |
| 40. | 1.00 | 25.0 | 0.02 | 33.79 | 0.00 | 0.0514 | 0.0000 | 0.0000 | 22.45 | -0.01 | 1534.1 | 0.06 | |

CRUISE 965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 18 FEB 65 TIME 2300 ZONE -R DEPTH 43 AIR TEMP 78.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 0. | 1.00 | 26.4 | 0.02 | 33.52 | 0.00 | 0.0524 | 0.0000 | 21.83 | -0.01 | 1536.3 | 0.06 |
| 10. | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.91 | -0.01 | 1536.1 | 0.06 |
| 20. | 1.00 | 26.1 | 0.02 | 33.55 | 0.00 | 0.0521 | 0.0000 | 21.94 | -0.01 | 1536.0 | 0.06 |
| 30. | 1.00 | 25.8 | 0.02 | 33.59 | 0.00 | 0.0520 | 0.0000 | 22.04 | -0.01 | 1535.7 | 0.06 |
| 35. | 1.00 | 25.7 | 0.02 | 33.64 | 0.00 | 0.0519 | 0.0000 | 22.14 | -0.01 | 1535.4 | 0.06 |
| 40. | 1.00 | 25.5 | 0.02 | 33.68 | 0.00 | 0.0518 | 0.0000 | 22.21 | -0.01 | 1535.2 | 0.06 |

CRUISE 965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 19 FEB 65 TIME 0300 ZONE -R DEPTH 43 AIR TEMP 77.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 0. | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.84 | -0.01 | 1536.3 | 0.06 |
| 10. | 1.00 | 26.4 | 0.02 | 33.54 | 0.00 | 0.0524 | 0.0000 | 21.84 | -0.01 | 1536.5 | 0.06 |
| 20. | 1.00 | 26.1 | 0.02 | 33.55 | 0.00 | 0.0522 | 0.0000 | 21.92 | -0.01 | 1536.2 | 0.06 |
| 30. | 1.00 | 25.8 | 0.02 | 33.60 | 0.00 | 0.0520 | 0.0000 | 22.06 | -0.01 | 1535.7 | 0.06 |
| 35. | 1.00 | 25.8 | 0.02 | 33.62 | 0.00 | 0.0520 | 0.0000 | 22.08 | -0.01 | 1535.7 | 0.06 |
| 40. | 1.00 | 25.6 | 0.02 | 33.66 | 0.00 | 0.0518 | 0.0000 | 22.18 | -0.01 | 1535.3 | 0.06 |

CRUISE 965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 19 FEB 65 TIME 0100 ZONE -R DEPTH 43 AIR TEMP 76.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 0. | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.85 | -0.01 | 1536.3 | 0.06 |
| 10. | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.85 | -0.01 | 1536.4 | 0.06 |
| 20. | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.91 | -0.01 | 1536.2 | 0.06 |
| 30. | 1.00 | 25.9 | 0.02 | 33.59 | 0.00 | 0.0520 | 0.0000 | 22.04 | -0.01 | 1535.8 | 0.06 |
| 35. | 1.00 | 25.7 | 0.02 | 33.63 | 0.00 | 0.0519 | 0.0000 | 22.11 | -0.01 | 1535.5 | 0.06 |
| 40. | 1.00 | 25.6 | 0.02 | 33.65 | 0.00 | 0.0518 | 0.0000 | 22.16 | -0.01 | 1535.4 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 19 FEB 65 TIME 0200 ZONE -R DEPTH 43 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | STGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5 | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.85 | -0.01 | 1536.3 | 0.06 |
| 10 | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.85 | -0.01 | 1536.4 | 0.06 |
| 20 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0522 | 0.0000 | 21.90 | -0.01 | 1536.3 | 0.06 |
| 30 | 1.00 | 26.1 | 0.02 | 33.55 | 0.00 | 0.0522 | 0.0000 | 21.94 | -0.01 | 1536.2 | 0.06 |
| 40 | 1.00 | 25.9 | 0.02 | 33.58 | 0.00 | 0.0520 | 0.0000 | 22.02 | -0.01 | 1535.9 | 0.06 |
| 40 | 1.00 | 25.6 | 0.02 | 33.65 | 0.00 | 0.0518 | 0.0000 | 22.16 | -0.01 | 1535.4 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 19 FEB 65 TIME 0300 ZONE -R DEPTH 43 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | STGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5 | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.85 | -0.01 | 1536.2 | 0.06 |
| 10 | 1.00 | 26.3 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.86 | -0.01 | 1536.4 | 0.06 |
| 20 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.4 | 0.06 |
| 30 | 1.00 | 26.1 | 0.02 | 33.55 | 0.00 | 0.0522 | 0.0000 | 21.92 | -0.01 | 1536.4 | 0.06 |
| 35 | 1.00 | 26.0 | 0.02 | 33.58 | 0.00 | 0.0521 | 0.0000 | 22.00 | -0.01 | 1536.1 | 0.06 |
| 40 | 1.00 | 25.8 | 0.02 | 33.61 | 0.00 | 0.0520 | 0.0000 | 22.06 | -0.01 | 1535.9 | 0.06 |

CRUISE —965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSDEN SQUARE 0
 DATE 19 FEB 65 TIME 0400 ZONE -R DEPTH 43 AIR TEMP 70.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | STGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5 | 1.00 | 26.4 | 0.02 | 33.53 | 0.00 | 0.0524 | 0.0000 | 21.86 | -0.01 | 1536.2 | 0.06 |
| 10 | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.2 | 0.06 |
| 20 | 1.00 | 26.1 | 0.02 | 33.55 | 0.00 | 0.0522 | 0.0000 | 21.93 | -0.01 | 1536.1 | 0.06 |
| 30 | 1.00 | 25.7 | 0.02 | 33.62 | 0.00 | 0.0519 | 0.0000 | 22.11 | -0.01 | 1535.4 | 0.06 |
| 35 | 1.00 | 25.6 | 0.02 | 33.67 | 0.00 | 0.0518 | 0.0000 | 22.19 | -0.01 | 1535.2 | 0.06 |
| 40 | 1.00 | 25.1 | 0.02 | 33.79 | 0.00 | 0.0515 | 0.0000 | 22.43 | -0.01 | 1534.3 | 0.06 |

CRUISE — 965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE C
 DATE 19 FEB 65 TIME 0500 ZONE -8 DEPTH 43 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.88 | -0.01 | 1536.1 | 0.06 |
| 10. | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.89 | -0.01 | 1536.2 | 0.06 |
| 20. | 1.00 | 26.1 | 0.02 | 33.57 | 0.00 | 0.0520 | 0.0000 | 22.01 | -0.01 | 1535.7 | 0.06 |
| 30. | 1.00 | 25.5 | 0.02 | 33.67 | 0.00 | 0.0518 | 0.0000 | 22.20 | -0.01 | 1535.1 | 0.06 |
| 35. | 1.00 | 25.3 | 0.02 | 33.74 | 0.00 | 0.0517 | 0.0000 | 22.32 | -0.01 | 1534.8 | 0.06 |
| 40. | 1.00 | 25.1 | 0.02 | 33.78 | 0.00 | 0.0515 | 0.0000 | 22.40 | -0.01 | 1534.5 | 0.06 |

CRUISE — 965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE 0
 DATE 19 FEB 65 TIME 0600 ZONE -8 DEPTH 43 AIR TEMP 0.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.55 | 0.00 | 0.0523 | 0.0000 | 21.91 | -0.01 | 1536.0 | 0.06 |
| 10. | 1.00 | 26.2 | 0.02 | 33.54 | 0.00 | 0.0523 | 0.0000 | 21.90 | -0.01 | 1536.1 | 0.06 |
| 20. | 1.00 | 26.1 | 0.02 | 33.56 | 0.00 | 0.0522 | 0.0000 | 21.95 | -0.01 | 1536.0 | 0.06 |
| 30. | 1.00 | 25.7 | 0.02 | 33.65 | 0.00 | 0.0519 | 0.0000 | 22.15 | -0.01 | 1535.4 | 0.06 |
| 35. | 1.00 | 25.4 | 0.02 | 33.71 | 0.00 | 0.0517 | 0.0000 | 22.26 | -0.01 | 1535.0 | 0.06 |
| 40. | 1.00 | 25.2 | 0.02 | 33.75 | 0.00 | 0.0516 | 0.0000 | 22.35 | -0.01 | 1534.6 | 0.06 |

CRUISE — 965 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARS DEN SQUARE 0
 DATE 19 FEB 65 TIME 0700 ZONE -8 DEPTH 43 AIR TEMP 75.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 0. | 1.00 | 26.2 | 0.02 | 33.55 | 0.00 | 0.0522 | 0.0000 | 21.92 | -0.01 | 1535.9 | 0.06 |
| 10. | 1.00 | 26.2 | 0.02 | 33.56 | 0.00 | 0.0523 | 0.0000 | 21.92 | -0.01 | 1536.1 | 0.06 |
| 20. | 1.00 | 26.1 | 0.02 | 33.56 | 0.00 | 0.0522 | 0.0000 | 21.93 | -0.01 | 1536.2 | 0.06 |
| 30. | 1.00 | 25.7 | 0.02 | 33.64 | 0.00 | 0.0519 | 0.0000 | 22.12 | -0.01 | 1535.5 | 0.06 |
| 35. | 1.00 | 25.6 | 0.02 | 33.67 | 0.00 | 0.0519 | 0.0000 | 22.17 | -0.01 | 1535.4 | 0.06 |
| 40. | 1.00 | 25.4 | 0.02 | 33.72 | 0.00 | 0.0517 | 0.0000 | 22.28 | -0.01 | 1535.0 | 0.06 |

CRUISE —765 STATION SEA 4 10 LATITUDE 14 46.6 N LONGITUDE 120 12.9 E MARSUEN SQUARE 0
 DATE 14 FEB 65 TIME 0800 ZONE -8 DEPTH 43 AIR TEMP 80.0 TEMP INSTR RTH SAL INSTR NAN

| DEPTH | DEV. | TEMP | DEV. | SALINITY | DEV. | ELEC. COND. | DEV. | SIGMA-T | DEV. | SOUND VEL. | DEV. |
|-------|------|------|------|----------|------|-------------|--------|---------|-------|------------|------|
| 5. | 1.00 | 26.1 | 0.02 | 33.52 | 0.00 | 0.0522 | 0.0000 | 21.90 | -0.01 | 1535.8 | 0.06 |
| 10. | 1.00 | 26.1 | 0.02 | 33.52 | 0.00 | 0.0522 | 0.0000 | 21.90 | -0.01 | 1536.0 | 0.06 |
| 20. | 1.00 | 26.0 | 0.02 | 33.54 | 0.00 | 0.0521 | 0.0000 | 21.96 | -0.01 | 1535.8 | 0.06 |
| 30. | 1.00 | 25.7 | 0.02 | 33.60 | 0.00 | 0.0519 | 0.0000 | 22.08 | -0.01 | 1535.5 | 0.06 |
| 40. | 1.00 | 25.6 | 0.02 | 33.64 | 0.00 | 0.0518 | 0.0000 | 22.16 | -0.01 | 1535.3 | 0.06 |
| 45. | 1.00 | 25.3 | 0.02 | 33.68 | 0.00 | 0.0516 | 0.0000 | 22.27 | -0.01 | 1534.8 | 0.06 |

APPENDIX B

Core Analysis Summary Sheets

1. Engineering Properties
2. Sediment Size and
Composition

1. EXPLANATION OF DATA PAGES
CORE ANALYSIS SUMMARY SHEET
Engineering Properties

Results of engineering properties, core analysis performed by the U. S. Naval Oceanographic Office Geological Laboratory are recorded on Core Analysis Summary Sheet Engineering Properties.

The following is a description of the terms employed on the Core Analysis Summary Sheet:

1. Cruise Number. A number assigned to each cruise for identification purposes.
2. Latitude. Expressed in degrees, minutes, and seconds.
3. Longitude. Expressed in degrees, minutes, and seconds.
4. Sample Number. A consecutive number, commencing with 1, applied to each core taken successively throughout the cruise.
5. Date Taken. Day (GMT), month, and year.
6. Water Depth (m). The uncorrected sonic sounding recorded in meters.
7. Type Corer. Identified by the name of device employed.
8. Core Length (cm). Recorded in centimeters as observed in the laboratory.
9. Core Penetration (cm). Recorded in centimeters as observed in the field.
10. Subsample Depth in Core (cm). Interval of subsample as measured in centimeters from the top of the core.
11. Wet Unit Weight (g/cm^3). The weight (solids plus water) per unit volume of the sediment mass.
12. Specific Gravity of Solids. The ratio of weight in air of a given volume of a sediment at 20°C to the weight in air of an equal volume of distilled water at 20°C .
13. Water Content (% dry weight). The ratio, in percent, of the weight of water in a given mass of the sediment sample to the weight of the solid particles.

14. Void Ratio. The ratio of the volume of void spaces to the volume of solid particles in the sediment sample as computed from Wet Unit Weight, Specific Gravity of Solids, and Water Content.

15. Saturated Void Ratio. The Void Ratio at 100 percent saturation as computed from Water Content and Specific Gravity of Solids.

$$\text{Saturated Void Ratio} = \frac{\text{Water Content} \times \text{Specific Gravity of Solids}}{100}$$

16. Porosity (%). The ratio, usually expressed as a percentage, of the volume of voids of a sediment mass to the total volume of the sediment mass.

17. Liquid Limit. Water Content, in percent, at which a pat of sediment cut by a groove of standard dimension will flow together for a distance of 1/2 inch under the impact of 25 blows in a standard liquid limit apparatus.

18. Plastic Limit. Water Content, in percent, at which a sediment will just begin to crumble when rolled into a thread approximately 1/8 inch in diameter.

19. Plasticity Index. The numerical difference between the Liquid Limit and Plastic Limit of the sediment mass.

20. Liquidity Index. The ratio, expressed in percentage, of (1) the natural water content of the sediment sample minus its Plastic Limit to (2) its Plasticity Index.

21. Compression Index. The slope of the linear portion of the Pressure-Void Ratio curve on a semi-log plot.

22. Compressive Strength. The load per unit area required to shear an unconfined, natural or remolded, sediment mass.

23. Cohesion. The shearing strength per unit area under zero externally applied load.

24. Sensitivity. The ratio of the natural to the remolded strength. It is a measure of the loss of strength due to remolding the sediment mass.

25. Angle of Internal Friction (°). The angle between the abscissa and the tangent of the curve representing the relationship of "shearing resistance" to "normal stress" acting within a sediment mass.

26. Activity. The ratio of the Plasticity Index to the clay fraction percentage (< .002 mm) of the sediment mass.

27. Modulus of Elasticity. The ratio of stress to strain of the sediment mass.

28. Slump (%). The ratio, in percent, of the amount of height change immediately before the compressive strength test to the original height of a cylinder of sediment.

PRNC-NAVOCEANO-3167/18 B (4-63)

CORE ANALYSIS SUMMARY SHEET
ENGINEERING PROPERTIES

EVANS
ANALYZED BY MAGAN
DATE 9 APRIL 65

| 1. CRUISE NO. | 4. SAMPLE NO. | 9-1 | B.S.-1 | 7. TYPE CORER |
|---|----------------------------------|------------|--------|---------------|
| 2. LATITUDE 14° 46' 33" | 5. DATE TAKEN (Day, month, year) | 17 FEB. 65 | | KOLLENTBERG |
| 3. LONGITUDE 120° 12' 38" | 6. WATER DEPTH (m) | 56.5 | | |
| 10. SUBSAMPLE DEPTH IN CORE (cm) | 8. CORE LENGTH (cm) | 0-10 | 10-17 | 17-29 |
| 11. WET UNIT WEIGHT (g/cm ³) | 9. CORER PENETRATION (cm) | 1.52 | 29-36 | 36-48 |
| 12. SPECIFIC GRAVITY OF SOLIDS | | 1.55 | 50-57 | 57-69 |
| 13. WATER CONTENT (% dry weight) | | 91.11 | 71.49 | 54.32 |
| 14. VOID RATIO | | | | 1.58 |
| 15. SATURATED VOID RATIO | | | | |
| 16. POROSITY (%) | | | | |
| 17. LIQUID LIMIT | | | | |
| 18. PLASTIC LIMIT | | | | |
| 19. PLASTICITY INDEX | | | | |
| 20. LIQUIDITY INDEX | | | | |
| 21. COMPRESSION INDEX FROM LL | | | | |
| 22. COMPRESSIVE STRENGTH | NATURAL (g/cm ²) | | 91.65 | |
| | REMOULD (g/cm ²) | | | |
| 23. COHESION | NATURAL (g/cm ²) | 53.71 | 28.82 | 61.73 |
| | REMOULD (g/cm ²) | 18.17 | | 8.93 |
| 24. SENSITIVITY | | 2.86 | | 6.41 |
| 25. ANGLE OF INTERNAL FRICTION (°) | | | | |
| 26. ACTIVITY | | | | |
| 27. MODULUS OF ELASTICITY g/cm ² | | | 460 | |
| 28. SLUMP (%) | | | 1.63 | |

29. REMARKS: GREENISH SANDY MUD, NO RAGS, NO FREE WATER. CORES INSERTED DURING STORAGE. MAISTUZE SAMPLES TAKEN JUST ABOVE ENGINEER'S TROD. SAMPLE: ORGANIC DORZ. FOLDED PLASTIC ON BOTTOM. DCP @ 29-36 CM. HIT FOSSIL WITH TUBE CORE CUT @ 42 CM

ITEM No - 270

2. EXPLANATION OF COMPUTER DATA SHEET SEDIMENT SIZE AND COMPOSITION

Results of sediment-size and -composition core analysis performed by the U. S. Naval Oceanographic Office Geological Laboratory are tabulated on Computer Data Sheet Sediment Size and Composition.

The following is an explanation of the terms employed on the Computer Data Sheet:

1. CRUISE. A number assigned to each cruise for identification purposes.
2. SAMPLE. A consecutive number applied to each core taken successively throughout the cruise.
3. LATITUDE. Expressed in degrees, minutes, and tenths of minutes.
4. LONGITUDE. Expressed in degrees, minutes, and tenths of minutes.
5. TAKEN. Date in month, day, and year that core was taken.
6. CORER TYPE. Number corresponding to sampling device code below.

| | |
|-------------------------|----------------|
| 1. Hydroplastic piston | 6. Orange Peel |
| 2. Hydroplastic gravity | 7. Ewing |
| 3. Kullenberg piston | 8. Vibrocorer |
| 4. Kullenberg gravity | 9. Dredge |
| 5. Phleger gravity | 0. Other |
7. LENGTH. Length of core recorded in centimeters as observed in the laboratory.
8. PENETRATION. Penetration of coring device recorded in centimeters as observed in the field.
9. DEPTH. The uncorrected sonic sounding recorded in meters.
10. ANALYZED. Date in month, day, and year that core was analyzed in the laboratory.
11. ID. NO. Three digit laboratory project number followed by consecutive number assigned to each subsample analyzed.
12. INTERVAL. Interval of subsample as measured in centimeters from the top of the core.

13. MM. Particle diameter size intervals based on Wentworth size grades in millimeters.
14. PER. Percent of total sample weight within the given size interval.
15. GRAVEL, SAND, SILT, CLAY. Percent of total sample weight within the four size classes.

Class ranges are: Gravel - coarser than 2 mm
 Sand - 2 to 0.0625 mm
 Silt - 0.0625 to 0.0039 mm
 Clay - finer than 0.0039 mm

16. MEAN (MM). The geometric mean of the distribution expressed in millimeters.
17. MEAN (PHI). The logarithmic mean of the distribution expressed in phi units (-log₂ of the diameter in millimeters).
18. STAN DEV. Standard deviation. A measure of the degree of spread or dispersion of the distribution about the mean expressed in phi units.

$$\sigma = \sqrt{\sum f (X_i - \bar{X})^2 / 100}$$

19. SKEWNESS. A measure of the asymmetry of the distribution. Positive values denote skewness of the distribution toward the fine particles, negative values denote skewness toward the coarse particles. A normal distribution has a skewness of 0.

$$\alpha_3 = \frac{1}{100} \sigma^{-3} \sum f (X_i - \bar{X})^3$$

20. KURTOSIS. A measure of the peakedness of the distribution. Positive values denote a "leptokurtic" distribution, or a distribution more "peaked" than normal. Negative values denote a "platykurtic" distribution, or a distribution more "flat" than normal. A normal curve has a kurtosis of 0.

$$\alpha_4 = \frac{1}{100} \sigma^{-4} \sum f (X_i - \bar{X})^4 - 3$$

21. CACO₃. Percent calcium carbonate of the total sample weight as determined by the insoluble residue method.
22. ORG CARBON. Percent organic carbon of the total sample weight as determined by the Allison method.

23. COLOR. Wet sediment color, based on the Geological Society of America Rock-Color Chart, as determined in the laboratory.

24. DOM MINERAL. Dominant mineral (s) comprising the sample assemblage.

25. SEC MINERAL. Secondary mineral (s) comprising the sample assemblage.

SEDIMENT SIZE AND COMPOSITION DATA

CRUISE TYPE 4
CORER TYPE 4

SAMPLE 9-1
LENGTH 87.0

LATITUDE 14 46.6
PENETRATION 90.0

270 9
10.0- 17.0

270 10
29.0- 36.0

270 11
50.0- 57.0

270 12
60.0- 78.0

DATE 17/02/65
ANALYZED 9/24/65

| NO. | PER | PER | PER | PER | PER |
|-------------|---------|---------|---------|---------|---------|
| 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| 2.0000 | 2.941 | 3.943 | 5.396 | 5.323 | 4.323 |
| 1.0000 | 3.043 | 3.393 | 3.364 | 3.574 | 3.574 |
| 0.5000 | 7.201 | 9.896 | 10.512 | 5.446 | 5.446 |
| 0.2500 | 23.428 | 22.997 | 25.979 | 20.033 | 20.033 |
| 0.1250 | 16.129 | 15.080 | 24.247 | 25.852 | 25.852 |
| 0.0625 | 4.462 | 4.053 | 4.415 | 8.479 | 8.479 |
| 0.0312 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0156 | 0.114 | 9.708 | 1.962 | 4.406 | 4.406 |
| 0.0078 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0039 | 11.664 | 0.184 | 11.563 | 13.300 | 13.300 |
| 0.0020 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0010 | 7.099 | 14.138 | 4.595 | 6.234 | 6.234 |
| 0.0005 | 3.043 | 3.299 | 7.358 | 0.831 | 0.831 |
| 0.0000- | 12.677 | 11.310 | 0.701 | 7.481 | 7.481 |
| GRAVEL | 2.941 | 0.943 | 5.396 | 4.323 | 4.323 |
| SAND | 54.962 | 55.419 | 68.465 | 63.425 | 63.425 |
| SILT | 19.777 | 14.892 | 13.525 | 17.706 | 17.706 |
| CLAY | 22.819 | 28.746 | 12.614 | 14.547 | 14.547 |
| MEAN (MM) | 0.0394 | 0.0160 | 0.0970 | 0.0639 | 0.0639 |
| MEAN (PHI) | 4.6693 | 4.7950 | 3.3059 | 3.9660 | 3.9660 |
| STAN DEV | 3.9954 | 4.0280 | 3.4230 | 3.5681 | 3.5681 |
| SKEWNESS | 0.2909 | 0.2349 | 0.4647 | 0.3828 | 0.3828 |
| KURTOSIS | -1.1658 | -1.3256 | -0.3550 | -0.5321 | -0.5321 |
| CACO3 | 30.900 | 25.600 | 30.200 | 18.800 | 18.800 |
| ORG CARBON | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| COLOR | 5Y 2/1 | 5Y 2/1 | 5Y 2/1 | 5Y 2/1 | 5Y 2/1 |
| DOM MINERAL | QUARTZ | QUARTZ | QUARTZ | QUARTZ | QUARTZ |
| SEC MINERAL | CALCITE | CALCITE | CALCITE | CALCITE | CALCITE |

SPRINT SIZE ANALYSIS COMPOSITION DATA

TAKEN 14/07/65
ANALYZED 13/04/65

CRUISE CORER TYPE 4 SAMPLE LENGTH 270 26 132.0 270 27 33.0- 40.0 270 28 53.0- 60.0 270 29 73.0- 80.0 270 30 93.0-100.0

LONGITUDE 120 12.9 DEPTH 43.0

| MM | PER | PER | PER | PER |
|---------|--------|--------|--------|--------|
| 4.0000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2.0000 | 3.558 | 1.924 | 2.687 | 5.621 |
| 1.0000 | 7.979 | 4.918 | 4.880 | 6.916 |
| 0.5000 | 1.624 | 13.685 | 13.932 | 12.214 |
| 0.2500 | 25.280 | 21.739 | 20.797 | 27.699 |
| 0.1250 | 24.059 | 17.801 | 18.246 | 20.468 |
| 0.0625 | 9.667 | 7.491 | 6.223 | 8.199 |
| 0.0312 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0156 | 7.347 | 4.949 | 6.719 | 7.250 |
| 0.0078 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0039 | 5.474 | 10.691 | 10.962 | 6.693 |
| 0.0020 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0010 | 4.254 | 3.920 | 2.829 | 3.823 |
| 0.0005 | 1.954 | 0.356 | 1.768 | 0.279 |
| 0.0000- | 9.281 | 9.286 | 10.962 | 6.135 |

| | | | | | |
|------------|---------|---------|---------|---------|--------|
| GRAVEL | 3.558 | 4.261 | 1.574 | 2.687 | 1.574 |
| SAND | 68.217 | 68.316 | 68.852 | 64.074 | 70.460 |
| SILT | 12.761 | 14.702 | 15.691 | 17.660 | 13.843 |
| CLAY | 15.469 | 12.715 | 13.540 | 15.559 | 11.110 |
| MEAN (MM) | 0.0799 | 0.0965 | 0.0770 | 0.073 | 0.097 |
| MEAN (PHI) | 3.7204 | 3.3729 | 3.6682 | 3.697 | 3.607 |
| STAN DEV | 3.6097 | 3.6674 | 3.6004 | 3.906 | 3.1921 |
| SKENNESS | 0.4998 | 0.5062 | 0.4928 | 0.422 | 0.5751 |
| KURTOSIS | -0.0841 | -0.0925 | -0.2282 | -0.5659 | 1.5543 |

| | | | | | |
|-------------|---------|---------|---------|---------|---------|
| CACO3 | 36.100 | 34.400 | 34.600 | 30.500 | 29.100 |
| ORG CARBON | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| COLOR | 5Y 4/2 | 5Y 4/2 | 5Y 4/2 | 5Y 4/2 | 5Y 4/2 |
| DOM MINERAL | QUARTZ | QUARTZ | QUARTZ | QUARTZ | QUARTZ |
| SEC MINERAL | CALCITE | CALCITE | CALCITE | CALCITE | CALCITE |

SEDIMENT SIZE AND COMPOSITION DATA

CRUISE 3 SAMPLE 3 LATITUDE 14 46.5 LONGITUDE 123 12.3 TAKEN 19/02/65
 CORE TYPE 4 LENGTH 110.0 PENETRATION 150.0 DEPTH 0.0 ANALYZED 14/04/65

10. NO. 270 39 370 40 270 41 270 42 370 43 270 44
 INTERVAL 13.0-20.0 33.0-40.0 53.0-60.0 73.0-80.0 93.0-100.0 105.0-111.0

| NO. | PER | PER | PER | PER | PER |
|-------------|---------|---------|---------|---------|---------|
| 1.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2.0000 | 2.297 | 0.416 | 0.498 | 1.285 | 2.029 |
| 1.0000 | 1.148 | 0.914 | 0.458 | 1.285 | 1.029 |
| 0.5000 | 1.015 | 2.171 | 1.664 | 1.353 | 3.257 |
| 0.2500 | 9.187 | 5.684 | 2.234 | 2.367 | 2.917 |
| 1.1250 | 11.252 | 14.971 | 13.047 | 18.013 | 14.797 |
| 0.0625 | 7.177 | 14.642 | 21.761 | 14.797 | 17.540 |
| 0.0312 | 0.000 | 9.331 | 11.542 | 11.486 | 8.917 |
| 0.0156 | 13.684 | 2.000 | 0.000 | 1.000 | 0.000 |
| 0.0078 | 0.000 | 1.160 | 6.363 | 1.201 | 3.699 |
| 0.0039 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0020 | 0.000 | 18.730 | 11.628 | 1.117 | 15.393 |
| 0.0010 | 12.913 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.0005 | 5.742 | 13.143 | 7.284 | 5.695 | 8.353 |
| 0.0000- | 16.268 | 4.010 | 12.474 | 3.123 | 2.903 |
| | | 15.571 | 11.213 | 1.092 | 12.530 |
| GRAVEL | 2.297 | 0.914 | 0.416 | 0.498 | 1.285 |
| SAND | 30.622 | 45.600 | 34.651 | 49.834 | 65.004 |
| SILT | 32.193 | 19.771 | 25.911 | 17.691 | 22.742 |
| CLAY | 34.620 | 33.714 | 39.222 | 21.977 | 17.385 |
| MEAN (MM) | 0.0112 | 0.0164 | 0.0093 | 0.0187 | 0.03485 |
| MEAN (PMI) | 6.4769 | 5.9274 | 6.7466 | 5.7434 | 4.3647 |
| STAN DEV | 3.7290 | 6.0077 | 3.7598 | 3.8235 | 3.6356 |
| SKEWNESS | -0.1127 | 0.0164 | -0.1099 | 0.1236 | 0.1368 |
| KURTOSIS | -1.1419 | -1.5100 | -1.4224 | -1.5051 | -1.3035 |
| CACCS | 29.200 | 32.800 | 30.800 | 24.900 | 28.700 |
| ORG CARBON | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| COLOR | 5Y 4/2 | 5Y 4/2 | 5Y 4/2 | 5Y 4/2 | 5Y 4/2 |
| DOM MINERAL | QUARTZ | QUARTZ | QUARTZ | QUARTZ | QUARTZ |
| SEC MINERAL | CALCITE | CALCITE | CALCITE | CALCITE | CALCITE |

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| 13. ABSTRACT The U.S. Naval Oceanographic Office (NAVOCEANO) conducted a limited environmental survey in Subic Bay, Republic of the Philippines, in January and February 1965. The purpose of the survey was to measure oceanographic environmental parameters in support of NAVOCEANO's mine warfare program. Temperature and salinity measurements and bottom sediment samples were obtained at 10 stations. Two of these stations were time-series anchor stations with current measurements and ambient noise recordings. The influence of tidal currents are thought to be responsible for the fluctuation of higher density waters through the entrance channel to Subic Bay on either slope of predicted high water. Maximum current speed was 0.4 knot. Characteristically, flow direction at intermediate levels often differed from the flow of the surface and near-bottom depths. 10. Distribution Statement (con.) "Approved for public release; distribution unlimited." | | | |

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